2015

ANNUAL EPIDEMIOLOGICAL REPORT

hpsc

HSE

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

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2015

ANNUAL EPIDEMIOLOGICAL REPORT

01

VACCINE PREVENTABLE DISEASES

1.1 *Haemophilus influenzae* (invasive)

Summary

Number of cases, 2015: 52
Number of cases, 2014: 61
Number of cases, 2013: 41
Crude incidence rate, 2015: 1.1/100,0000

In 2015, 52 cases of invasive *Haemophilus influenzae* disease were notified in Ireland (1.13 cases per 100,000 total population). This is a 14.8% decrease on the number reported in the previous year. In 2004 the incidence rate was 0.89 cases/100,000. No imported cases were reported in 2015.

The main change in 2015, when compared to 2014, is the decrease in the number of non-typeable/non-capsular strains from 38 to 24 (Figure 1).

Non-typeable/non-capsular cases accounted for the majority of the invasive *H. influenzae* cases notified in 2015 (46.2%, n=24/52). The remaining cases were due to *H. influenzae* 'not type b' (9.6%; n=5), type f (3.8%; n=2), and isolates that were not typed (40.4%; n=21), of which 10 (19.2%) were diagnosed by PCR testing only. The median age of cases was 25 years (range two days to 93 years). The incidence rates were highest in infants <1 year (15.2/100,000) and those aged 1 to 4 years (2.8/100,000) (Table 1).

Cases occurring in children <10 years of age (n=22) and in elderly adults (65 years of age and older (n=18)) accounted for 76.9% of all invasive *H. influenzae* notifications in 2015 (Table 1). One notable trend since 2004 is the increase in the overall proportion of cases 65+ years of age from 26.3% to 34.6% in 2015 compared to the decline over the same period in those aged between 5 and 64 years from 47.4% to 26.9%.

In 2015, the highest frequency of cases occurs in the 0-4 year age group (38.5%; n=20), after which it falls sharply before increasing again among those aged 65+ years (34.6%; n=18) (Table 1), consistent with what has been observed since 2004 (Figure 2).

In 2015, the number of male cases (n=26) was identical to that of females giving a male to female ratio of 1:1. The M:F

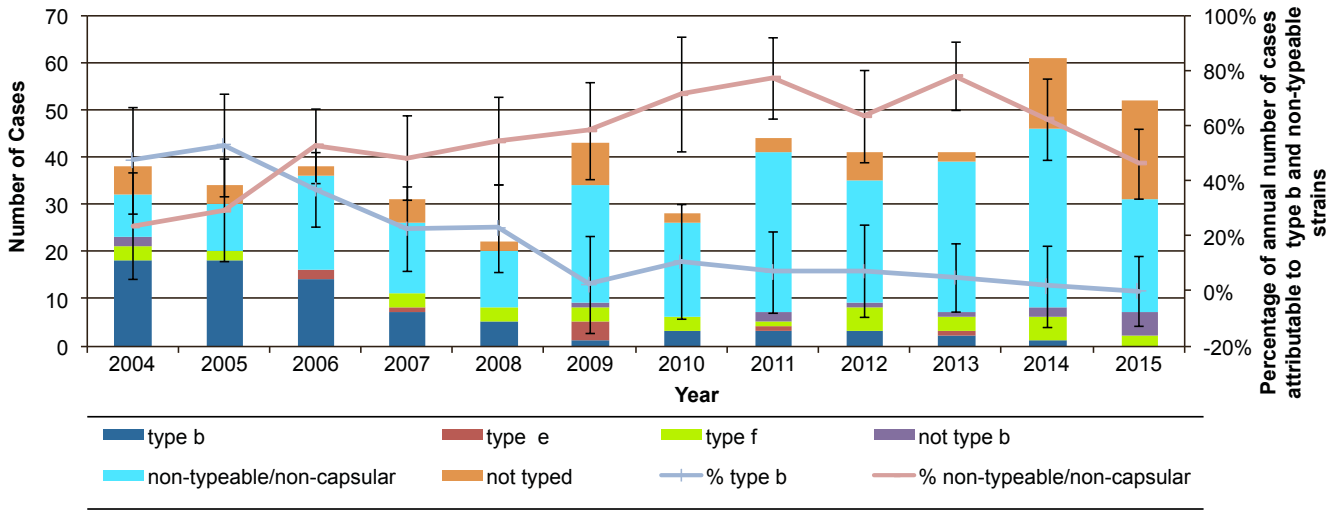

Figure 1. Number of invasive H. influenzae cases and proportion of cases attributable to type b and non-typeable strains with 95% confidence intervals, Ireland, 2004-2015

ratio has been observed to vary considerably in recent years with a 0.5:1 ratio recorded in 2014 and 2.7:1 in 2013 (Figure 3).

Between 2005 and 2011, the fewest quarterly number of cases has consistently been in the third quarter, but since 2012 that pattern no longer applies (Figure 3).

Incidence of disease in 2015 was highest in the HSE E area (1.6/100,000) with the lowest in the HSE M area (0.35/100,000) (Table 2). No HSE area had an incidence rate that was significantly different from the national rate (Figure 4).

A breakdown by clinical diagnosis for all cases by age group between 2004 and 2015 is presented in Table 3. In 2015, 23.1% (n=12/52) of cases did not have a clinical diagnosis recorded.

Two deaths were reported among the 52 cases in 2015, one aged 1-2 years and one aged 70-74 years. Their cause of death was not reported. One had a confirmed non-typeable infection with bacteraemia and the other, a possible case, had epiglottitis.

In 2015, there were no cases of *H. influenzae* type b (Hib) reported, the result of a long term trend: in 2014, only one case of Hib occurred, with two cases in 2013 and 18 cases notified in both 2004 and 2005. Between Q3-2007 and Q4-2015, an eight and a half year period, only one true Hib vaccine failure was reported, highlighting the continuing positive impact that the Hib booster catch up campaign has had in Ireland.

Since September 2008, the Hib booster dose has been administered at 13 months of age as part of the routine childhood immunisation schedule in addition to the three doses given during infancy (at 2, 4 and 6 months of age).

Table 1. Number and incidence rates of invasive H. influenzae cases by serotype and age group, Ireland, 2015

Age Group	type b	type e	type f	not type b	non-typeable/ non-capsular	not typed (all)	not typed, PCR only diagnosis	not typed	Total	ASIR
<1	0	0	0	3	2	6	5	1	11	15.19
1-4	0	0	0	0	1	8	3	5	9	2.81
5-9	0	0	0	0	0	2	1	1	2	0.66
10-14	0	0	0	0	0	0	0	0	0	0.00
15-19	0	0	0	1	0	0	0	0	1	0.34
20-24	0	0	0	0	2	1	0	1	3	0.40
25-34	0	0	1	0	2	1	0	1	4	0.58
35-44	0	0	0	0	2	0	0	0	2	0.35
45-54	0	0	0	0	1	1	1	0	2	0.43
55-64	0	0	0	0	0	0	0	0	0	0.00
65+	0	0	1	1	14	2	0	2	18	0.39
Total	0	0	2	5	24	21	10	11	52	1.13
CIR	0.00	0.00	0.04	0.11	0.52	0.46	0.22	0.24	1.13	-

CIR, crude incidence rate per 100,000 total population; ASIR, age specific incidence rate per 100,000 population

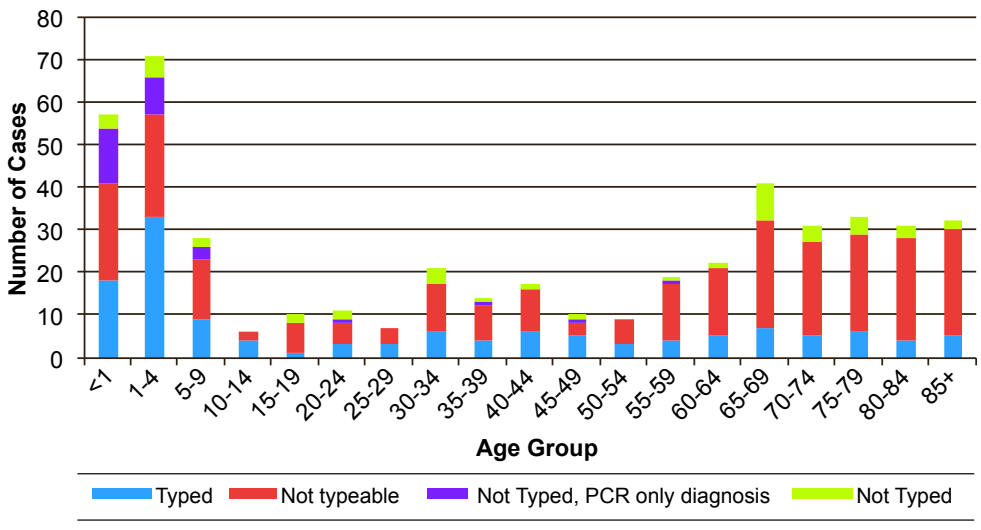

Figure 2. Number of H. influenzae cases by agegroup and type, Ireland, 2004-2015*
** Typed includes b, e, f, not-b*

Table 2. Incidence rates per 100,000 population of invasive H. influenzae by HSE area, Ireland, 2004-2015

HSE Area	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
E	1.07	1.00	0.87	0.80	0.53	0.74	0.56	1.11	1.11	0.62	0.99	1.60
M	1.19	1.19	0.40	1.19	0.79	1.06	0.35	1.06	0.35	1.42	1.77	0.35
MW	0.83	0.28	0.83	0.55	0.83	2.11	0.53	0.53	1.05	0.79	2.11	1.05
NE	0.25	1.27	0.25	0.00	0.00	0.23	0.45	1.59	0.91	1.36	1.59	0.91
NW	0.42	0.00	2.11	0.42	0.00	0.39	0.39	0.77	0.77	1.16	0.39	0.77
SE	1.08	0.43	0.87	1.08	0.65	1.00	1.00	0.80	1.21	1.00	2.41	1.21
S	1.13	0.32	1.29	0.32	0.64	1.20	1.05	0.30	0.60	0.90	1.20	0.75
W	0.48	1.45	0.72	1.45	0.48	1.12	0.22	1.35	0.45	0.90	0.90	0.90
Ireland	0.90	0.80	0.90	0.73	0.52	0.94	0.61	0.96	0.89	0.89	1.33	1.13

Table 3. Number of invasive H. influenzae cases by clinical diagnosis, Ireland, 2004-2015

Clinical diagnosis	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% 2015
Septicaemia	8	14	13	6	3	9	9	11	11	14	15	14	26.9%
Pneumonia	5	0	3	6	3	8	5	12	12	4	12	8	15.4%
Meningitis	3	9	3	2	2	2	1	3	2	2	7	3	5.8%
Bacteraemia (without focus)	1	0	1	1	2	0	0	3	5	6	9	8	15.4%
Other	1	2	1	0	0	0	0	3	4	7	7	3	5.8%
Epiglottitis	1	3	3	1	1	0	2	0	0	3	1	1	1.9%
Cellulitis	1	1	2	1	1	0	0	1	0	0	0	1	1.9%
Meningitis & septicaemia	1	0	1	0	1	1	1	1	1	0	0	2	3.8%
Osteomyelitis	1	0	0	0	0	0	0	0	0	0	0	0	0.0%
Septic arthritis	0	1	0	0	1	0	0	0	0	0	0	0	0.0%
Not specified	16	4	11	14	8	23	10	10	6	5	10	12	23.1%
Total	38	34	38	31	22	43	28	44	41	41	61	52	100 %
% Not specified	42.1%	11.8%	28.9%	45.2%	36.4%	53.5%	35.7%	22.7%	14.6%	12.2%	16.4%	23.1%	-

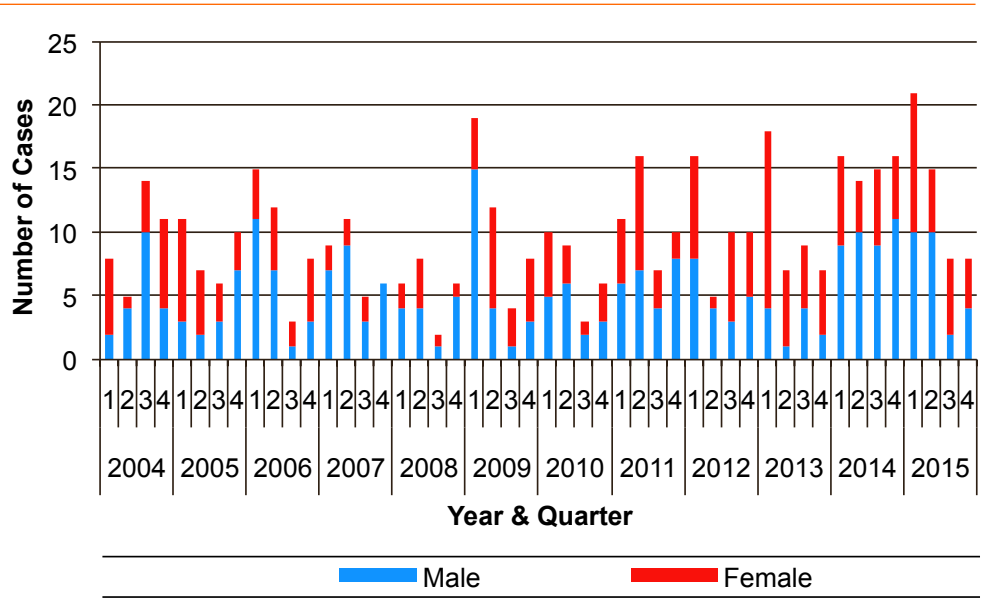

Figure 3. Number of H. influenzae cases by year/quarter and gender, Ireland, 2004-2015

Furthermore, vaccination is routinely recommended for those at increased risk of Hib disease due to underlying medical conditions or treatments.

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 30th August, 2016. These figures may differ from those published previously due to on-going updating of notification data on CIDR.

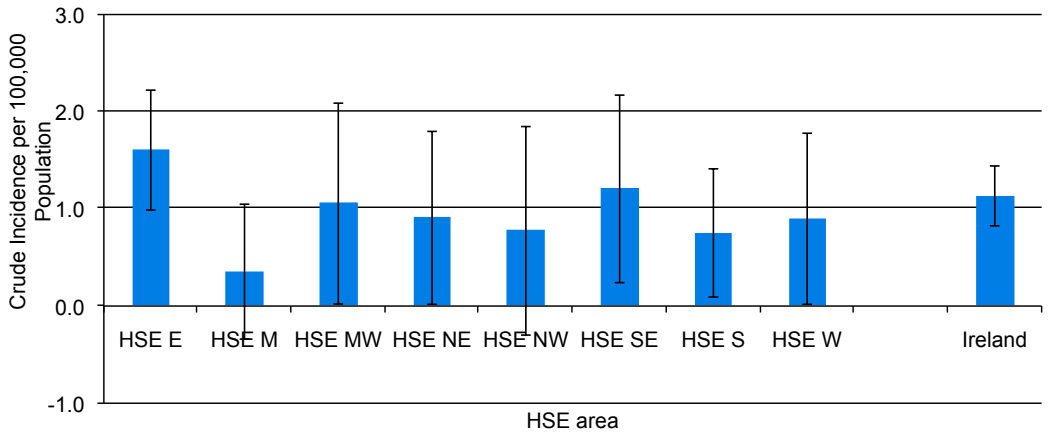

Figure 4. Crude incidence rates per 100,000 population with 95% confidence intervals for H. influenzae notifications by HSE area, Ireland, 2015

1.2 Measles

Summary

Number of cases, 2015: 2
Number of confirmed cases, 2015: 2
Crude incidence rate, 2015: 0.04/100,000

There were two measles cases (0.04/100,000) in 2015. This is the lowest annual number reported since 1948 (figures 1 and 2).

Both measles cases were classified as confirmed. The first case was imported, with probable country of infection reported as Indonesia. Measles virus from this case was genotyped by the NVRL and was genotype D8. The second case was epidemiologically linked to it with probable country of infection recorded as Ireland. The cases were in the age groups 10-14 years and 15-19 years. One case was unvaccinated while the second case had one dose of MMR. Both cases were hospitalised. One of the cases was reported as having pneumonia.

The figures presented above are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 16th August 2016. These figures may differ slightly from those published previously due to ongoing updating of notification data on CIDR.

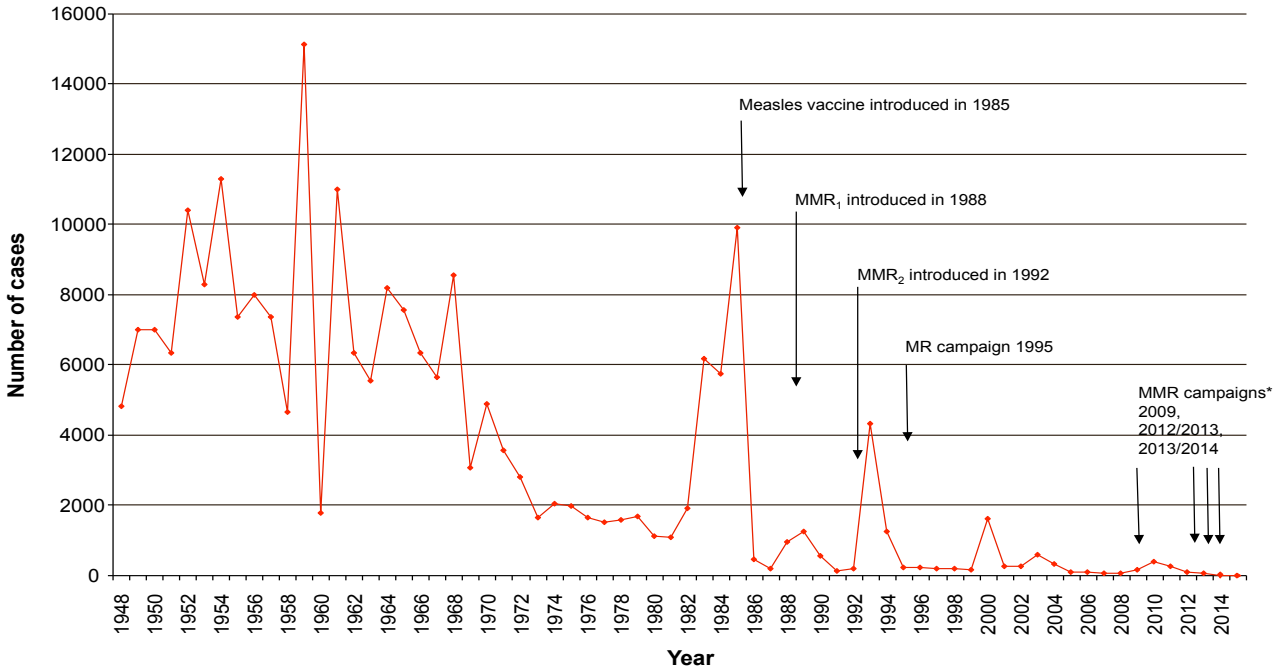

Figure 1. Annual number of measles cases in Ireland 1948-2015, the year of introduction of the measles vaccine and the measles mumps rubella (MMR) vaccine and vaccination campaigns years

A measles and rubella (MR) campaign for primary school age children was conducted in 1995
**A MMR vaccination campaign started in April 2009 for students in fourth, fifth and sixth year of second level schools*
**A MMR catch-up campaign was conducted during the 2012/2013 and 2013/2014 academic years for children/students attending primary schools, second level schools and special schools and home-schooled students who had not completed (or were not sure they had) their two dose MMR vaccination schedule.*
MMR_1-first dose of MMR
MMR_2-second dose of MMR
1948-June 2000 data collated by DoHC
July 2000-2015 data collated by HPSC

WHO require information on discarded measles cases ie measles cases investigated and who were found not to meet the case definition. The HSE Areas reported the number of discarded CIDR cases to HPSC. For 2015, 69 cases were discarded from CIDR as following investigation they were not considered to be measles cases. Discarded cases are not available in CIDR for reporting and are therefore not included in the analysis above.

The NVRL is the WHO accredited National Measles Rubella laboratory for Ireland. Laboratories that perform measles or rubella investigations in their own laboratories are requested to send all positive samples for measles or rubella to the NVRL for confirmatory testing. In addition, a selection of negative specimens should also be referred. Genotyping is undertaken on a selection of specimens.

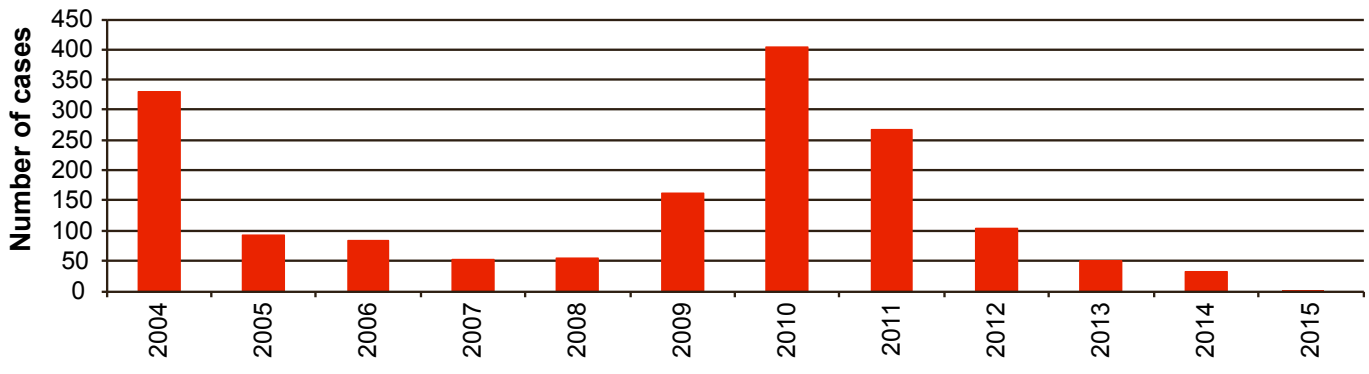

Figure 2. Number of measles cases by year, 2004-2015

1.3 Meningococcal disease

Summary

Number of cases, 2015: 75
Number of cases, 2014: 82
Number of cases, 2013: 81
Crude incidence rate, 2015: 1.6/100,000

Between 1999 and 2012, a marked downward trend in invasive meningococcal disease (IMD) incidence was observed: in 1999 there were 536 cases (14.8/100,000) and in 2012 there were 66 cases (1.4/100,000), a decline of almost 88%. In 2015, however, 75 cases (1.6/100,000) of IMD were notified, seven fewer reported than in the previous year (n=82).

Typically, most cases in 2015 were diagnosed by blood/CSF culture testing, blood/CSF PCR testing or by detection of Gram negative diplococci in skin lesions/culture or in CSF specimens. Isolation of the organism from non-sterile sites (such as the eye, nose or throat) in clinically compatible cases is considered a possible case.

Of the 75 cases notified in 2015, 67 (89.3%) were case classified as confirmed and eight (10.7%) as possible. Confirmation of diagnosis by laboratory testing of cases has improved with time. In 2015, 89.3% (n=67/75) of cases were confirmed by laboratory testing in comparison to 83.0% (n=445/536) in 1999.

In 2015, 31 of the 67 confirmed cases (46.3%) were confirmed by PCR testing alone and another 12 confirmed cases (17.9%) were diagnosed by culture of sterile specimens alone. Of the remaining 24 (35.8%) confirmed cases, all were diagnosed by both culture and PCR testing of sterile specimens. Additional laboratory testing was done on the 67 confirmed cases: four had positive CSF microscopy test results and one had a positive skin lesion culture.

Of the eight possible cases reported in 2015, one had a positive laboratory test result based on an eye culture in which serogroup 29E was identified.

In 2015, male cases (n=42) exceeded female cases (n=33), resulting in a male to female ratio of 1.3:1.0, following a consistent pattern observed since 2005. IMD cases in 2015 ranged in age from one month to 92 years (median age of 3 years).

Overall incidence in Ireland was 1.6/100,000 population in 2015. The incidence of IMD was highest in infants and young children. Age specific incidence rate (ASIR) was highest among infants <1 year of age (18.0/100,000; n=13), followed by children in the 1 to 4 years (5.3/100,000; n=15), and 15 to 19 year age groups (4.9/100,000; n=14) (Table 1, Figure 1). Figure 2 presents the number of IMD cases by gender and age group between 1999 and 2015 and shows the decline in numbers across all of the age groups, with the steepest declines observed in the <1, 5-9 and 10-24 year age groups following the introduction of the meningococcal C conjugate (MCC) vaccine in late 2000.

At regional level, incidence was highest in the HSE MW area

Table 1. Number of cases, deaths, age-group specific incidence rates per 100,000 population (calculated using Census 2011 denominator data) and case fatality ratios of IMD, Ireland, 2015

Age Group	No. Cases	ASIR	No. Deaths	%CFR
<1	13	18.0	0	0.0%
1-4	15	5.3	1	6.7%
5-9	8	2.5	0	0.0%
10-14	4	1.3	0	0.0%
15-19	14	4.9	1	7.1%
20-24	2	0.7	0	0.0%
25+	19	0.6	1	5.3%
All ages	75	1.6	3	4.0%

ASIR, age specific incidence rate per 100,000 population; %CFR, case fatality ratio

(2.4/100,000) and lowest in the HSE E area (1.1/100,000) (Table 2). No area had an incidence rate that was significantly different from the national rate (Figure 3). There were no imported cases identified in 2015.

Apart from the years 2003, 2013 and 2014, IMD cases have tended to occur most frequently in the first quarter of each calendar year (Figure 4).

Neisseria meningitidis serogroup B was the pathogen most commonly associated with IMD in 2015 and accounted for 43 of the 75 (57.3%) notifications. However, this is a marked decline on what was previously reported between 2003 and 2014 when serogroup B accounted for more than 80% (n=1,703/2,031) of all IMD notifications (Figure 5).

In February 2015, a cluster of cases was reported in HSE S in Cork involving two siblings, aged 4 and 5 years with a serogroup B infection. Both cases recovered.

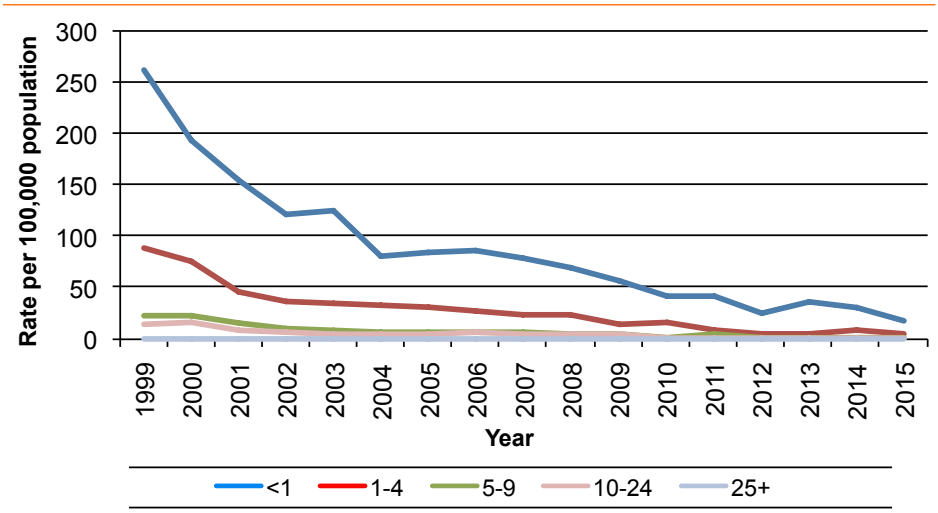

Figure 1. Age-specific rates per 100,000 population for invasive meningococcal disease (IMD), Ireland, 1999-2015

TTable 2. Age specific incidence rates per 100,000 population (calculated using Census 2011 denominator data) of IMD by HSE area and age group, Ireland, 2015

HSE Area	<1	1-4	5-9	10-14	15-19	20-24	25+	Total
HSE E	11.5	1.0	0.9	1.0	5.2	0.0	0.7	1.1
HSE M	20.7	5.2	0.0	4.9	11.3	0.0	0.6	2.1
HSE MW	17.5	17.5	11.4	0.0	0.0	4.1	0.0	2.4
HSE NE	39.0	3.2	0.0	0.0	14.7	0.0	0.0	1.8
HSE NW	0.0	6.3	5.3	0.0	18.0	0.0	0.6	2.3
HSE SE	26.2	6.5	2.8	5.7	0.0	0.0	0.6	1.8
HSE S	19.9	5.0	2.2	0.0	0.0	2.4	1.4	1.8
HSE W	15.1	11.5	3.2	0.0	0.0	0.0	0.7	1.6
Ireland	18.0	5.3	2.5	1.3	4.9	0.7	0.6	1.6

Table 3. Number of cases, deaths and case fatality ratios (%CFR) by year for meningococcal B and C disease, Ireland, 1999-2015

	Meningococcal B			Meningococcal C		
Year	No. Cases	No. Deaths	%CFR	No. Cases	No. Deaths	%CFR
1999	292	12	4.1	135	5	3.7
2000	258	13	5.0	139	11	7.9
2001	245	8	3.3	35	3	8.6
2002	199	8	4.0	14	0	0.0
2003	206	11	5.3	5	1	20.0
2004	163	7	4.3	5	1	20.0
2005	169	5	3.0	5	0	0.0
2006	168	5	3.0	4	0	0.0
2007	158	6	3.8	2	0	0.0
2008	149	6	4.0	4	1	25.0
2009	119	6	5.0	5	0	0.0
2010	93	4	4.3	4	0	0.0
2011	84	2	2.4	2	0	0.0
2012	58	1	1.7	0	0	0.0
2013	68	4	5.9	1	0	0.0
2014	69	3	4.3	6	1	16.7
2015	43	2	4.7	11	0	0.0

%CFR, case fatality ratio

There were three IMD related notified deaths in 2015 (case fatality ratio of 4.0%) (age range 16 months to 92 years) (Table 1). The death in a 16 month old was reported to be due to a serogroup B infection, but the cause of death was not reported in the other two: one had a serogroup B infection and the other had a non-groupable infection. This compares to an annual average of 4.9 deaths between 2005 and 2014. In 2015, the %CFR was highest amongst cases 15-19 years of age (7.1%) as a result of one death among 14 cases. The next highest %CFR was 6.7% (n=1/15) among cases aged 1-4 years.

IMD due to serogroup C (MenC) has remained at relatively low levels between 2003 and 2014 with an average of 3.4 cases occurring annually. However, in 2015, the highest number of MenC cases (n=11) since 2002 was observed, aged between 4 months and 73 years (Table 3). Three of these six cases that were unvaccinated (aged between 4 months and 73 years) had no risk factors reported; there were four vaccine failures (aged 3 to 16 years) and the vaccination status of the remaining case was incomplete (aged 15-19 years).

Since 2003, 14 true vaccine failures have been recorded. Prior to the introduction of the MCC vaccine, serogroup C incidence rate in 1999 was 3.7/100,000 population; in 2015 it was 0.24/100,000.

The recent increase in MenC cases, which began in 2014, may be attributable to waning population herd immunity. Recent studies undertaken in the United Kingdom have reported waning immunity to serogroup C disease following infant vaccination in early childhood. Furthermore, protection given by vaccination at 12 months also wanes by the teenage years, but vaccination later in childhood provides higher levels of antibody that persist for longer.[1-4] Evidence shows that MCC vaccination significantly reduces nasopharyngeal carriage of the serogroup C meningococcus, providing indirect protection through herd immunity.[5-6] The continuing increase in MenC cases in Ireland in 2015 may reflect a decline in this herd immunity.

The routine meningococcal C conjugate (MCC) vaccination programme in Ireland has recently changed in response

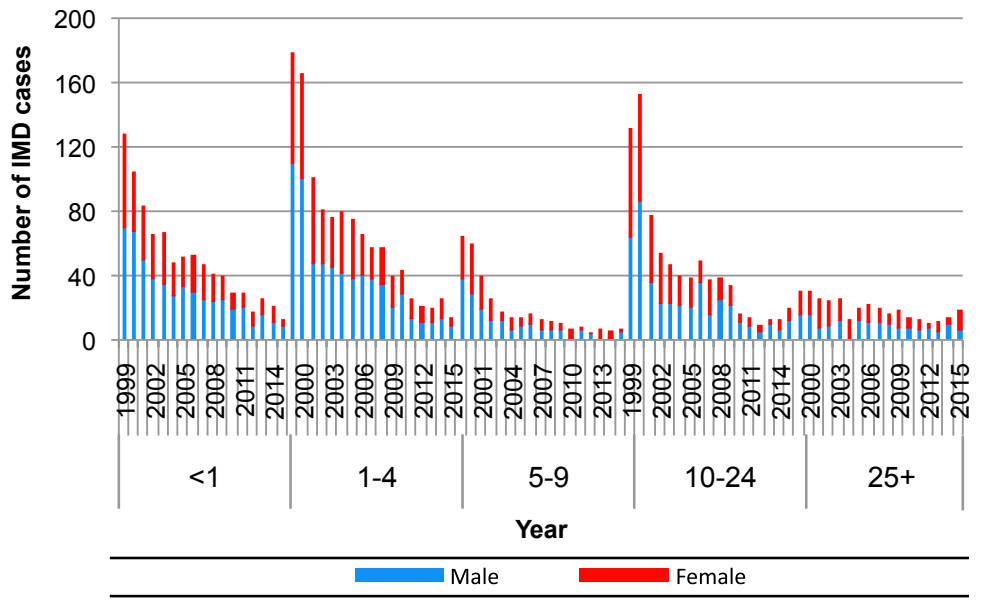

Figure 2. Number of IMD cases by gender and age group in Ireland, 1999-2015 (excludes one case with unknown gender details in 2009)

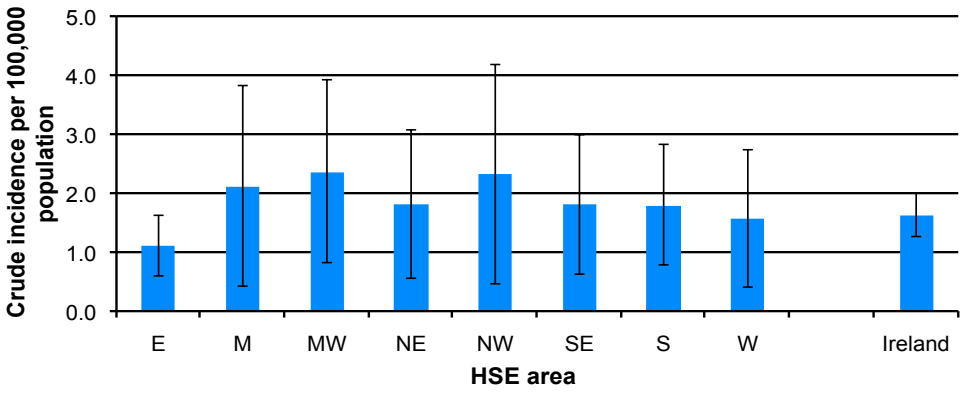

Figure 3. Crude incidence rates per 100,000 population with 95% confidence intervals for IMD notifications by HSE area, Ireland, 2015

to the recent increase in MenC cases and the emerging evidence of waning immunity. Instead of three doses of the MCC vaccine being administered to children at 4, 6 and 13 months of age, from July 2015 a single dose is given at 4 months, 13 months and at 12-13 years (if not previously vaccinated at >10 years of age) (http://www.hse.ie/eng/health/immunisation/hcpinfo/guidelines/chapter13.pdf).

The National Immunisation Advisory Committee (NIAC) also recommended a booster dose of the MCC vaccine for those considered at increased risk of MenC disease, and since 2011, the MCC vaccine booster has been recommended for close contacts of cases if their last dose was more than one year before. In August 2014, NIAC recommended an adolescent booster at 12-13 years to be offered in the first year of secondary level school. The adolescent booster MenC programme commenced in January 2015.

Despite the marked reduction in the overall incidence in the past decade, IMD is still an important public health concern due to its associated severity, high mortality rate and serious adverse sequelae. Complete IMD prevention and control requires effective vaccination. Effective vaccines are now available against serogroups A, B, C, W135 and Y forms of the disease. In 2012, Bexsero®, a recombinant multicomponent vaccine (4CMenB) against serogroup B disease was approved by the European Medicines Agency. In March 2014, the United Kingdom's Joint Committee on Vaccination and Immunisation (JCVI) recommended the vaccination of infants against serogroup B.[7] In Ireland, the primary childhood immunisation (PCI) schedule were updated in July 2016 so that all babies born on or after 1st October 2016 will be offered the MenB vaccine at 2, 4 and 12 months of age (https://www.hse.ie/eng/health/immunisation/infomaterials/newsletter/newsletter23.pdf). The MenB vaccine cannot be given at same time as MenC vaccine, which is given at 6 and 13 months of age.

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 26th August, 2016. These figures may differ from those published previously due to on-going updating of notification data on CIDR.

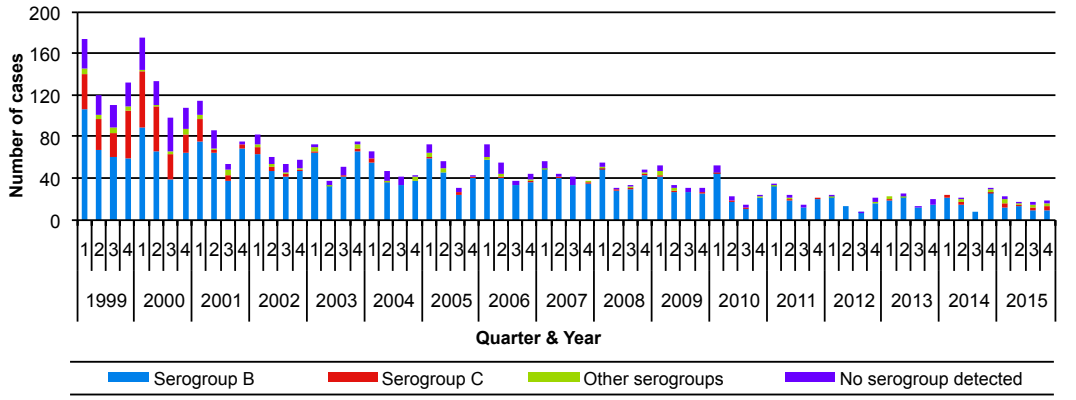

Figure 4. Number of IMD cases by quarter and serogroup, Ireland, 1999-2015

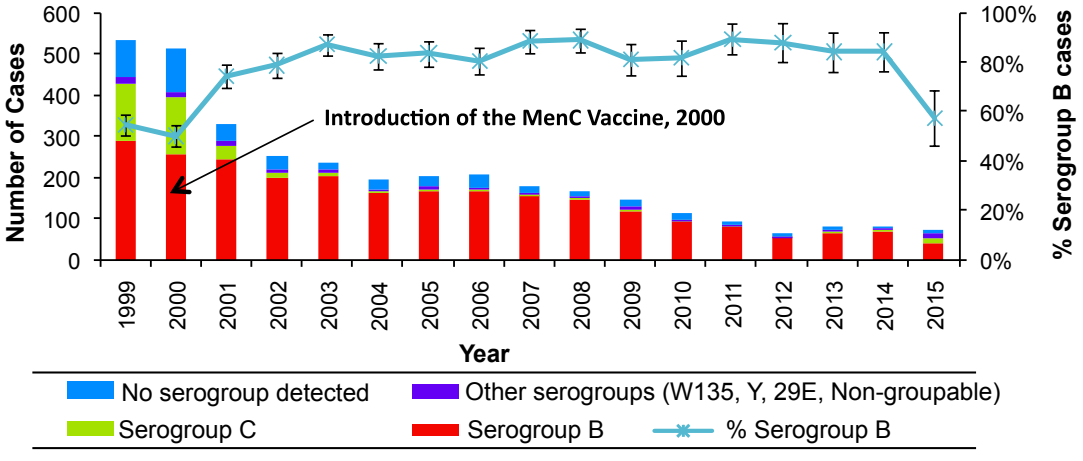

Figure 5. Number of IMD notifications in Ireland by serogroup and proportion of cases attributable to serogroup B with 95% confidence intervals, Ireland, 1999-2015

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1.4 Mumps

Summary

Number of cases, 2015: 2,014
Number of cases, 2014: 742
Crude incidence rate, 2015: 43.9/100,000

There was a large increase in mumps in 2015 with 2,014 (43.9/100,000) mumps cases notified. This is 2.7 fold higher than 2014 when 742 cases were notified and nine fold higher than 2013 when 223 cases were notified (figure 1). Large mumps outbreaks previously occurred during the years 2004/2005 and 2008/2009 (figure 1). Two-thirds (n=1,354) of the cases in 2015 were notified between January and June (figure 2).

In 2015, the largest number of cases was notified in the HSE S while the highest crude incidence rate was in the HSE NW (table 1).

Of the 2,014 mumps cases notified 50% (n=998) were classified as confirmed, 19% (n=381) as probable and 32% (n=635) were classified as possible.

The mean age of cases was 23 years and the median age of cases was 20 years with cases ranging in age from two months to 90 years. The highest age specific incidence rates were in those 15-19 years and 20-24 years (figure 3). Fifty eight per cent (n=1,173) of cases were male and 42% (n=838) were female while gender was not reported for three cases.

Mumps vaccine in Ireland is available as part of the combined measles mumps rubella (MMR) vaccine. In Ireland, vaccination with the first dose of MMR is routinely recommended at twelve months of age and the second dose at four to five years of age. A MMR catch up campaign started during the academic year 2012/2013 and continued during the academic year 2013/2014. During the MMR catch up campaign the HSE offered a dose of MMR vaccine to

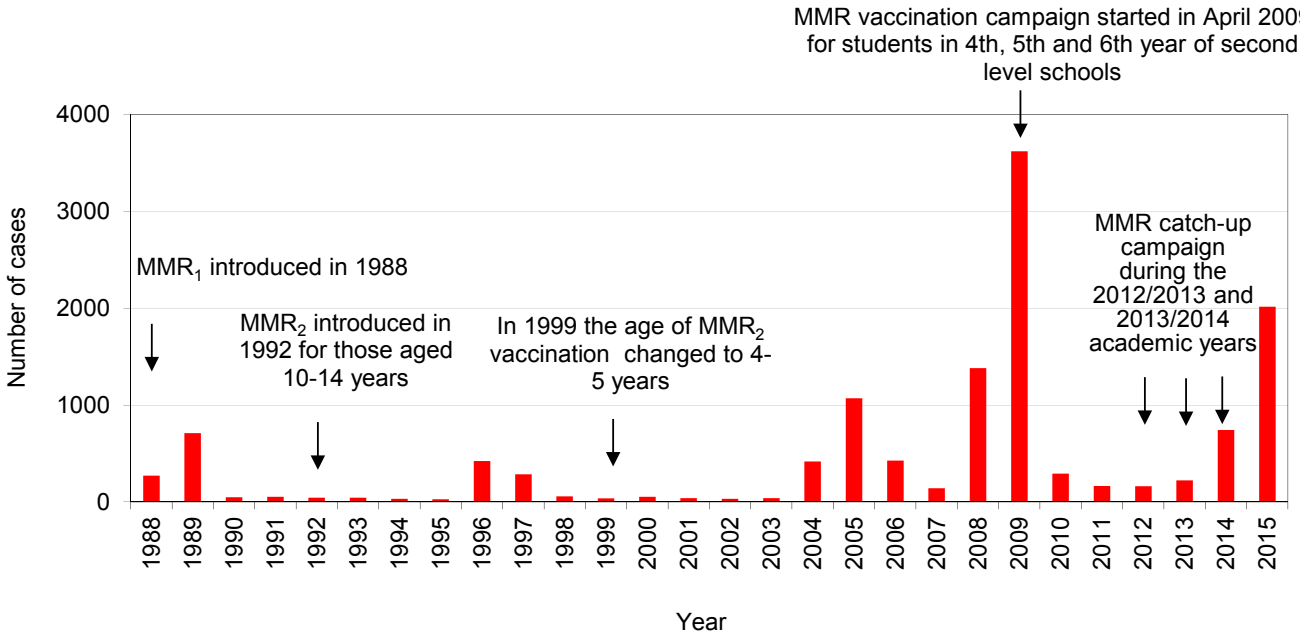

Figure 1. Number of mumps cases by year

A MMR catch-up campaign was conducted during the 2012/2013 and 2013/2014 academic years for children/students attending primary schools, second level schools and special schools and home-schooled students who had not completed (or were not sure they had) their two dose MMR vaccination schedule
MMR_1- first dose of MMR
MMR_2- second dose of MMR
1988-June 2000 data collated by DoHC
July 2000-2015 data collated by HPSC

children/students attending primary schools, second level schools and special schools and home-schooled students who had not completed (or were not sure they had) their two dose MMR vaccination schedule. Additionally, MMR vaccine continued to be recommended for students in college or universities if not previously vaccinated.

Of the 2,014 mumps cases, 10% (n=203) were unvaccinated, 12% (n=239) had one dose of MMR, 33% (n=667) were reported to have received two doses of MMR, one per cent (n=20) were reported to have three doses of MMR while for 44% (n=885) of cases the number of doses of MMR were not reported. The vaccination date was reported for 76% (n=182/239) of cases reported to have received one dose of MMR. Both vaccination dates were reported for 50% (n=336/667) of cases vaccinated with two doses of MMR. Forty per cent (n=268/667) of the cases reported to have received two doses of MMR were classified as confirmed; 41% (n=110/268) of these cases had both MMR vaccination dates reported. All three vaccination dates were available for 45% (n=9/20) of the cases given three doses of MMR. Of the 20 cases reported to have received three MMR doses eight were classified as confirmed cases; one of these eight cases had all three vaccination dates reported.

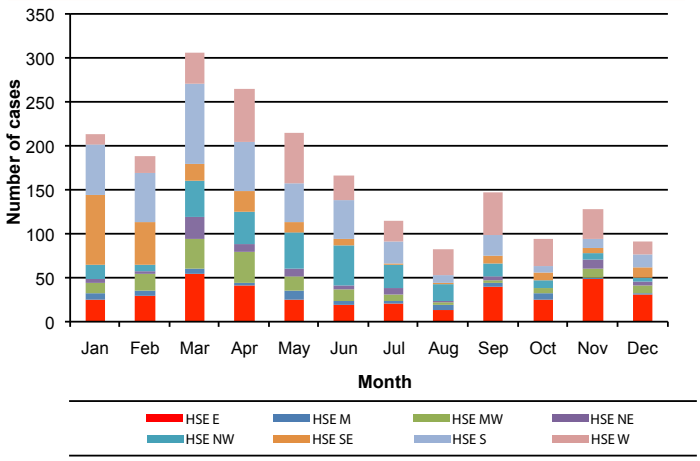

Figure 2. Number of mumps cases in 2015 by month and HSE Area

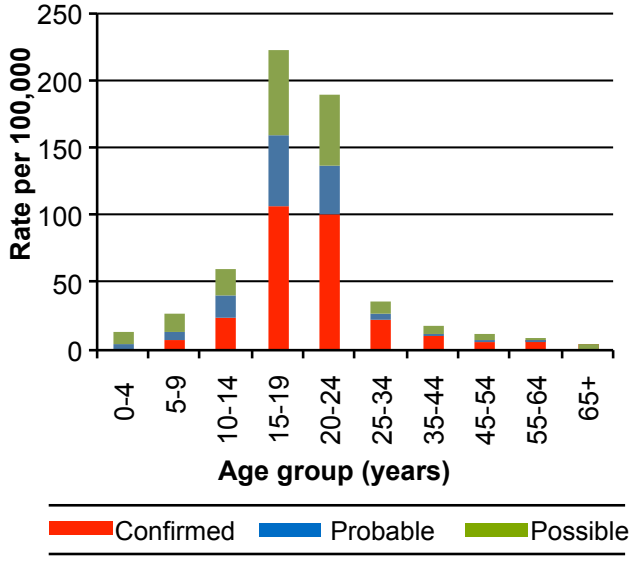

Figure 3. The age specific incidence rates (per 100,000 population) of mumps cases in 2015 by case classification

The country of birth was recorded as Ireland for 480 cases, was recorded as being a country other than Ireland for 94 cases and was unknown or not specified for the remainder.

Seventy two cases were hospitalised, representing four per cent (n=72/2,014) of all cases and six per cent (n=72/1,156) of cases where hospitalisation data was known. The number of days hospitalised was reported for 36 of the hospitalised cases; the median number of days hospitalised was four days (range one to 11 days).

The most commonly reported complications of mumps included orchitis (13%, n=68/520), meningitis (1.6%, n=14/865), pancreatitis (1.2%, n=10/855), deafness (0.8%, n=7/858), mastitis (0.2%, n=2/859), headache (n=4) and abdominal pain (n=3). For some cases a number of clinical complications were reported.

The setting where the case most likely acquired mumps was reported for 40% (n=815/2,014) of cases. The identified settings were: university/college (14%, n=279), social setting (12%, n=249), secondary school (8%, n=154), family/household (3%, n=63), primary school (2%, n=39), work (1%, n=23), other healthcare facility (0.2%, n=4), international travel (0.1%, n=3) and day-care/pre-school (0.05%, n=1).

The probable countries of infection were recorded as Ireland (n=767), Spain (n=2), Brazil (n=1), France (n=1), Italy (n=1), Poland (n=1), United Kingdom (n=1), United States Minor Outlying Islands (n=1) and was unknown or not specified for the remainder.

Thirty nine localised outbreaks of mumps were notified during 2015 with a total of 370 associated cases of illness. The outbreak locations included 15 school outbreaks (with 200 ill), nine private houses (with 32 ill), seven university/college outbreaks (with 90 ill), three community outbreaks (with 30 ill), two childcare facility outbreaks (with five ill), one extended family outbreak (with four ill) and two workplace outbreaks (with nine ill).

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 7th September 2016. These figures may differ slightly from those published previously due to ongoing updating of notification data on CIDR.

Table 1. Number of mumps cases and the crude incidence rate per 100,000 population (CIR) by HSE Area in 2015

HSE Area	Number	CIR
HSE E	379	23.4
HSE M	57	20.2
HSE MW	165	43.5
HSE NE	85	19.3
HSE NW	267	103.4
HSE SE	230	46.2
HSE S	438	65.9
HSE W	393	88.2
Total	**2014**	**43.9**

1.5 Other Forms of Bacterial Meningitis*
(*excluding meningococcal disease)

Summary

Number of cases, 2015: 32
Number of cases, 2014: 23
Number of cases, 2013: 21
Crude incidence rate, 2015: 0.69/100,000

Apart from *Neisseria meningitidis*, which is the most common cause of bacterial meningitis in Ireland, other pathogens cause this disease, including those caused by non-notifiable organisms. For information on invasive meningococcal disease (*Neisseria meningitidis*), see that chapter within this report. Information on bacterial meningitis caused by specified notifiable diseases is summarised below and further pathogen-specific data are available in the relevant chapter. The figures presented in this chapter are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 30th August, 2016. These figures may differ from those published previously due to on-going updating of notification data on CIDR.

Bacterial meningitis caused by diseases not otherwise specified (NOS):

In total, 32 cases of meningitis under this disease category were notified in 2015, two of whom died. Of these two deaths, one had a *Staphylococcus aureus* infection, which was reported as the cause of death and the other had an *Escherichia coli* infection. Half of the 32 (50%) cases were case classified as confirmed, nine as probable (28.1%) and seven as possible (21.9%) (Table 1). The causative pathogens were identified in 53.1% (n=17/32) of cases (Table 2).

Prior to 1st January 2012, all cases of Group B streptococcus, also known as *S. agalactiae*, were notifiable under the 'Bacterial Meningitis (NOS)' disease category. In 2012, this changed when *Streptococcus agalactiae* in children <90 days of age was notifiable in its own right, including those which were meningitis-related. This has meant that the overall number of bacterial meningitis (NOS) cases has, as a result, declined between 2012 and 2015 compared to previous years. In other words, without this change there would have been 25 extra cases reported under the bacterial meningitis (NOS) category between 2012 and 2015. Furthermore, there is evidence of an additional 43 possible meningitis-related cases of this disease in this same age group during this same four year period where *S. agalactiae* was either isolated from or detected in CSF specimens from patients that were not clinically categorised as having 'meningitis' and had in fact no clinical diagnosis reported on CIDR. These 43 cases have been excluded from Table 3, which is a summary breakdown of all bacterial meningitis cases by their causative pathogen (both specified and not specified types except for meningococcal disease) between 2010 and 2015.

Among the bacterial meningitis (NOS) cases notified in 2015 were 15 caused by *Escherichia coli* (age range two weeks to 82 years; none of which had serotype details reported) and one each caused by *Pasteurella multocida* (0-2 months) and *Staphylococcus aureus* (70-74 years). There were 15 other cases whose causative organism was not identified.

Bacterial meningitis caused by specified notifiable diseases:
Haemophilus influenzae

Five cases of meningitis due to *H. influenzae* were notified in 2015, three of which were attributable to strains that were not type b, one to a non-typeable/non-capsulated strain and one that was PCR diagnosed positive, not typed. The age range was one month to 86 years. No deaths were reported among these cases. See Table 3 and the chapter on invasive *H. influenzae* disease for further details.

Listeria species

Five cases of listeriosis meningitis were notified in 2015 (age range 16 months to 76 years), all of whom were male and one of which, an adult, died from the infection. Of the three serotypes identified, two were type 4b and one was type 1/2a. Of the five cases, two had an underlying medical condition reported, one of whom died. See Table 3 and the chapter on listeriosis disease for further details.

Mycobacterium species

During 2015 two tuberculosis meningitis cases, aged 40-79 years, were notified and both had risk factors reported (provisional at the time of writing). See Table 3 and the chapter on tuberculosis for further details.

Table 1. Number and percentage of bacterial meningitis (NOS) cases reported by case classification, Ireland, 2010-2015

Case Classification	2010	2011	2012	2013	2014	2015	2010-2015
Confirmed	21	18	12	6	13	16	86
Probable	7	4	5	5	8	9	38
Possible	14	13	12	10	2	7	58
Total	42	35	29	21	23	32	182
% Confirmed	50.0%	51.4%	41.4%	28.6%	56.5%	50.0%	47.3%

Note: Meningitis related-*Streptococcus agalactiae* < 90 days of age excluded from 2012, 2013, 2014 and 2015 figures

Table 2. Number and percentage of bacterial meningitis (NOS) cases reported with and without an identified causative organism, Ireland, 2010-2015

Causative Organism	2010	2011	2012	2013	2014	2015	2010-2015
Known	21	20	11	6	13	17	88
Unknown/Not specified	21	15	18	15	10	15	94
Total	42	35	29	21	23	32	182
% Known	50.0%	57.1%	37.9%	28.6%	56.5%	53.1%	48.4%

Note: Meningitis related-*Streptococcus agalactiae* < 90 days of age excluded from 2012, 2013, 2014 and 2015 figures

Table 3. Annual notifications of bacterial meningitis (specified and NOS) except invasive meningococcal disease, Ireland, 2010-2015

Notified under	Causative organism	2010	2011	2012	2013	2014	2015	2010-2015
Haemophilus influenzae disease (invasive)	*Haemophilus influenzae*	2	4	3	2	7	5	23
Leptospirosis	*Leptospira* spp.	0	1	1	0	0	0	2
Listerosis	*Listeria* spp.	3	2	2	2	1	5	15
Streptococcus pneumoniae infection (invasive)	*Streptococcus pneumoniae*	16	23	37	33	39	29	177
Streptococcus Group A infection (invasive) (iGAS)	*Streptococcus pyogenes*	2	0	1	3	0	4	10
Streptococcus Group B infection (invasive) (Group B Strep) < 90 days of age	*Streptococcus agalactiae*†	NA	NA	11	5	5	4	25
Tuberculosis*	*Mycobacterium* spp.*	9	2	4	3	1	2	21
Total Bacterial Meningitis, specified		**32**	**32**	**59**	**48**	**53**	**49**	**273**
Bacterial Meningitis, not otherwise specified	*Enterococcus faecium*	0	0	1	0	0	0	1
	Enterococcus species	0	0	0	0	1	0	1
	Escherichia coli	2	1	7	4	8	15	37
	Group C Streptococcus	0	0	1	0	0	0	1
	Klebsiella oxytoca	0	1	0	0	0	0	1
	Klebsiella pneumoniae	0	0	0	0	1	0	1
	Micrococcus luteus	0	0	0	0	1	0	1
	Mycoplasma pneumoniae	1	0	0	0	0	0	1
	Pasteurella multocida	0	0	0	0	0	1	1
	Staphylococcus aureus	6	2	1	0	0	1	10
	Staphylococcus aureus & *Staphylococcus capitis*	0	0	1	0	0	0	1
	Staphylococcus capitis	1	0	0	0	0	0	1
	*Streptococcus agalactiae***	11	16	0	1	1	0	29
	Streptococcus salivarius	0	0	0	1	0	0	1
	Streptococcus suis	0	0	0	0	1	0	1
	Unknown	1	1	2	2	1	2	9
	Not specified	20	14	16	13	9	13	85
Total Bacterial Meningitis, not otherwise specified		**42**	**35**	**29**	**21**	**23**	**32**	**182**
Total Bacterial Meningitis, specified and not otherwise specified		**74**	**67**	**88**	**69**	**76**	**81**	**455**

*Tuberculosis meningitis figure for 2015 is provisional

†*Streptococcus agalactiae* < 90 days of age in 2012 to 2015-these figures do not include 43 meningitis-related cases where the causative organism was isolated from or detected in CSF specimens from patients that were not clinically categorised as having 'meningitis'

**Streptococcus agalactiae* for all ages only in 2010 to 2011 and for cases > 90 days of age only in 2012 to 2015

NA not applicable

Streptococcus Group A infection (invasive) (iGAS)

Four cases of iGAS were notified during 2015, compared to none in the previous year (Table 3). The age range was 12 months to 39 years. Three of the cases were male and one female. Three of the four cases had risk factors identified, but no deaths were reported.

Streptococcus Group B infection (invasive) (Group B Strep) <90 days of age

Four cases of Group B Strep under 90 days of age were notified to CIDR during 2015, compared to five in 2014 (Table 3). Three of the four cases in 2015 were female and one was male. No deaths were reported.

Streptococcus pneumoniae

In 2015, 29 cases of pneumococcal meningitis were notified, compared to 39 in the previous year (Table 3). The median age was 54 years (range one month to 77 years). No pneumococcal meningitis-related deaths were reported during 2015. Of the 29 cases in 2015, data on vaccination status were available for 22 (75.9%) of the 29 cases; four cases were aged >65 years. Table 4 presents the vaccination status, serotype and additional risk factor for each case.

Table 4. Details of the 29 pneumococcal meningitis cases reported, Ireland, 2015

Case No.	Age Group (years)	Vaccination Status	No. of PCV13 / Prevenar 13 Doses	No. of PPV23 / Pneumovax 23 Doses	Serotype of Infection	Serotype Covered by Vaccine Type	Additional Risk Factors (excluding age 65+ years)
1	<1	Y	2	NA	12A	Not covered	N
2		N	0	0	NA		N
3		I	2	0	15B	PPV23	N
4	5-9	N	0	0	23A	Not covered	N
5		Y	2	0	NA		N
6	10-14	Y	0	1	33F	PPV23	Y
7		N	0	0	NA		N
8	20-24	U	0	NA	NA		Y
9	30-34	N	0	0	9N	PPV23	Y
10	35-39	U	0	NA	8	PPV23	N
11	40-44	U	0	NA	34	Not covered	NA
12	45-49	N	0	0	NA		N
13	50-54	N	0	0	19A	PCV13, PPV23	Y
14		U	0	NA	NA		Y
15		N	0	0	NA		Y
16	55-59	N	0	0	24F	Not covered	N
17		N	0	0	NA		Y
18		U	0	U	7F	PCV13, PPV23	N
19		Y	NA	U	NA		Y
20		N	0	0	NA		Y
21		U	0	NA	NA		NA
22	60-64	U	0	U	23A	Not covered	Y
23		N	0	0	8	PPV23	Y
24		N	0	0	NA		Y
25		N	0	0	24F	Not covered	Y
26	65+	N	0	0	22F	PPV23	N
27		N	0	0	22F	PPV23	Y
28		Y	0	1	9N	PPV23	Y
29		N	0	0	18C	PCV13, PPV23	Y

NA=not applicable or not available; Vaccinated: Y=Yes, N=No, U=Unknown, I=Incompletely vaccinated

1.6 Pertussis

Summary

Number of cases, 2015: 117
Number of cases, 2014: 73
Crude incidence rate, 2015: 2.5/100,000

Following an increase in pertussis in 2012 with 458 notifications (10.0/100,000), pertussis declined to 73 cases (1.6/100,000) in 2014 but increased slightly in 2015 with 117 cases (2.5/100,000) notified (figures 1 and 2).

Of the 117 cases in 2015, 64% (n=75) were classified as confirmed, 7% (n=8) were classified as probable and 29% (n=34) were classified as possible.

The largest number of cases was notified in the HSE E while the highest crude incidence rate was in the HSE W (table 1).

Fifty-seven percent of cases (n=67) were female and 43% (n=50) were male.

The largest number of cases and the highest age-specific incidence rate were in children aged less than one year followed by those in the age group 1-4 years (figures 3 and 4). Twenty nine percent (n=34/117) of all cases were aged less than six months of age. Six percent (n=7/117) of all cases were aged less than two months of age.

Maternal antibodies from women immunised before pregnancy wane quickly and the concentration of pertussis antibodies is unlikely to be high enough to provide passive

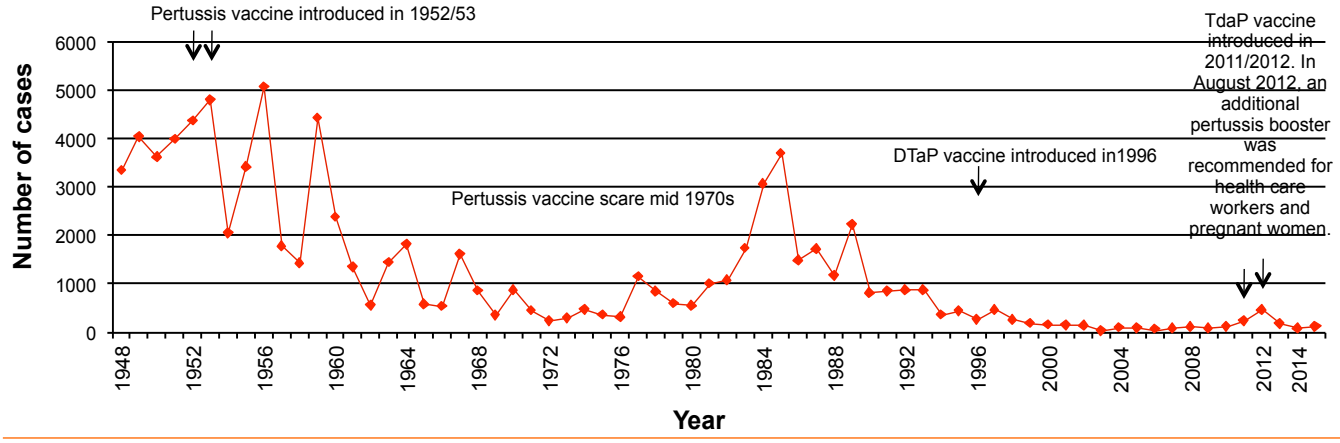

Figure 1. Number of notified pertussis cases in Ireland by year, 1948-2015
1948-June 2000 data collated by DoHC
July 2000-2015 data collated by HPSC

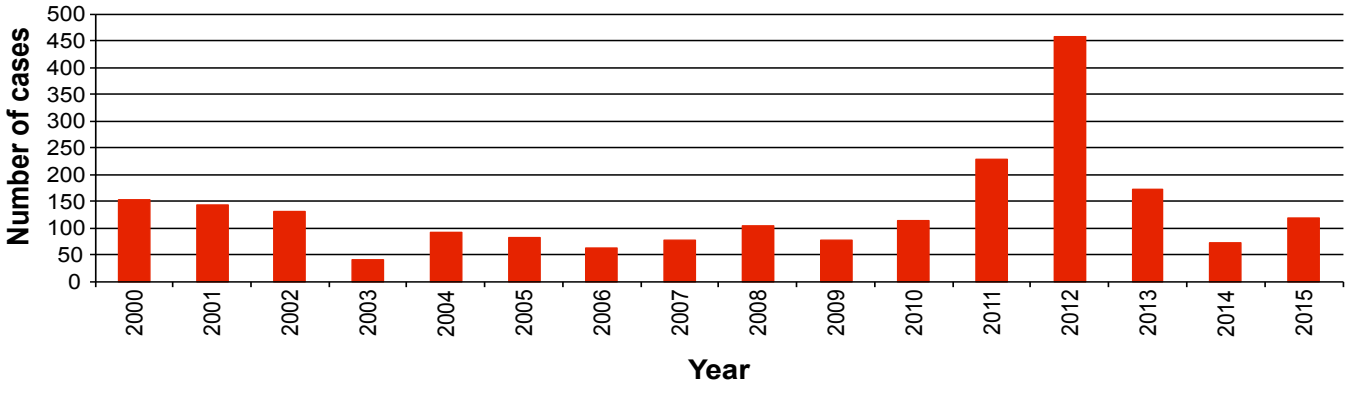

Figure 2. Number of notified pertussis cases in Ireland by year, 2000-2015

protection to their infants prior to primary vaccination. Since August 2012, the National Immunisation Advisory Committee (NIAC) has recommended that pregnant women should be offered tetanus and low dose diphtheria and acellular pertussis (Tdap) vaccine during 27 -36 weeks gestation in each pregnancy, to protect themselves and their infant. Tdap can be given at any time in pregnancy before 27 or after 36 weeks gestation although it may be less effective in providing passive protection to the infant.

In 2015, data on maternal antenatal vaccination status was provided for 27 children aged less than one year (69%, n=27/39). The mothers of 24 of these infant pertussis cases (62%, n=24/39) were unvaccinated during the antenatal period. Gestational age at birth was reported for seven of these 24 cases and ranged from 32 to 40 weeks with a median gestational age at birth of 39 weeks and a mean of 38 weeks. Three of the mothers of the infant pertussis cases (8%, n=3/39) reported vaccination during the antenatal period; one was vaccinated at 28 weeks gestation, one at 35 weeks gestation while this data was unreported for the third case.

In Ireland, it is recommended that children be vaccinated with an acellular pertussis containing vaccine at two, four and six months of age and a booster dose at four to five years of age. In 2008, NIAC recommended a booster with low dose acellular pertussis vaccine for children aged 11-14 years. The adolescent pertussis booster was introduced into the school programme, in 19 LHOs, in 2011 and to all schools in 2012. In August 2012, an additional pertussis booster was recommended for health care workers and pregnant women; please see the HSE National Immunisation Office website at http://www.immunisation.ie for additional information on pertussis vaccination recommendations.

In 2015, the number of doses of pertussis vaccine the cases received was reported for 66% (n=77/117) of cases. Twenty seven percent of cases (n=32/117) were unvaccinated; these cases ranged in age from one month to 73 years, with 59% (n=19/32) of these cases aged less than six months. Twenty two percent of the unvaccinated cases (n=7/32) were less than two months of age and were therefore not eligible for pertussis vaccine in the Irish schedule.

Nine percent (n=10/117) of cases were reported to have one dose of pertussis vaccine, all were less than eight months of age. Two percent (n=2/117) had two doses of pertussis vaccine, these cases were five months of age. Twenty one percent (n=24/117) had three doses of pertussis vaccine, these cases ranged in age from 9 months to 12 years. Eight percent (n=9/117) had four doses of pertussis vaccine, these cases ranged in age from six to 34 years. Of the cases reported to have four doses of pertussis vaccine one third were classified as confirmed (n=3/9) and 56% (n=5/9) had all four vaccine dates recorded.

Country of birth was reported as Ireland for 42 cases, Philippines for one, United Kingdom for one, and was unknown or not specified for the remainder (n=73).

Where data were provided, reported symptoms included cough (100%, n=86/86), paroxysmal cough (97%, n=87/90), any inspiratory whoop (74%, n=56/76), post-tussive vomiting (62%, n=49/79), choking episodes in infant (50%, n=13/26), apnoea (34%, n=25/74) and cyanosis (33%, n=22/66). Where data were provided, reported complications included pneumonia (3%, n=2/70), seizures (3%, n=2/71) and conjunctival haemorrhages (2%, n=1/66).

Thirty three cases were hospitalised, representing 28% (n=33/117) of all cases and 38% (n=33/87) of cases where hospitalisation data was known. Seventy nine percent (n=26/33) of those hospitalised were aged less than one year and 18% (n=6/33) were less than two months of age.

One of the cases was recorded as having long-term sequelae following infection.

Table 1. Number of pertussis cases notified and the crude incidence rate per 100,000 population (CIR) by HSE Area in 2015

HSE Area	Number	CIR
HSE E	48	3.0
HSE M	7	2.5
HSE MW	1	0.3
HSE NE	14	3.2
HSE NW	4	1.5
HSE SE	14	2.8
HSE S	14	2.1
HSE W	15	3.4
Total	**117**	**2.5**

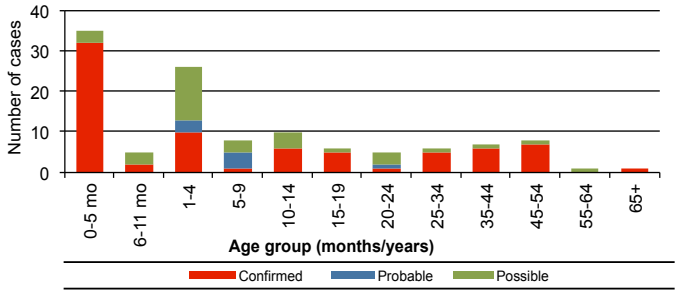

Figure 3. Number of notified pertussis cases in 2015 by age group and case classification.
'Mo' in graph indicates months ie 0-5 months and 6-11 months, the remaining age groups are in years

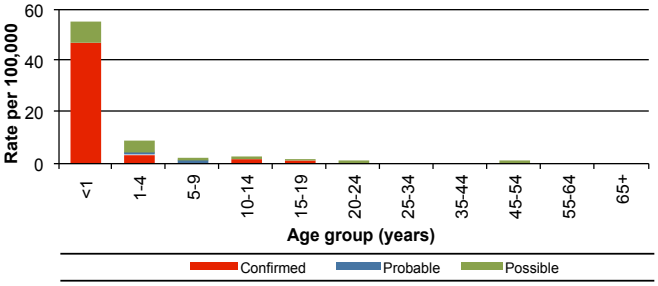

Figure 4. The age specific incidence rate (per 100,000 population) of notified pertussis cases in 2015 by case classification

Of the 117 cases, the likely setting of exposure to pertussis included home (23%, n=27), school (3%, n=3), other family setting (2%, n=2), crèche/childcare (1%, n=1), work (1%, n=1), and was unreported or not specified for the remainder (71%, n=83).

The likely source of exposure included sibling (8%, n=9), other relative (5%, n=6), mother (3%, n=4), father (2%, n=2), and was unknown or not specified for the remainder (82%, n=96).

Antibiotic usage was reported for 92% (n=81/88) of cases where this data was provided and for 69% of all cases (n=81/117). A second antibiotic was known to be given for 28% (n=23/81) of cases given a first antibiotic and known not to be given for 36% (n=29/81) of cases given a first antibiotic while this information was not provided for the remainder (36%, n=29/81).

Six localised pertussis outbreaks were notified during 2015, with 14 associated cases of illness. All outbreaks were associated with private houses.

The figures presented in this summary are based on data extracted from the CIDR system on 22nd August 2016. These figures may differ slightly from those published previously due to ongoing updating of notification data on CIDR.

1.7 Rubella

Summary

Number of cases, 2015: 2
Number of confirmed cases, 2015: 0

In 2015, two cases (0.04/100,000) of rubella were notified in Ireland compared to three cases notified in 2014. Of the two cases in 2015 one was in the age group 3-4 years and one was in the age group 20-29 years.

Both cases were classified as possible cases.

One of the possible cases met the criteria for possible rubella case classification; unfortunately no samples were obtained. A second case, also classified as possible, was serum IgM negative for rubella, however, no onset date or rash onset dates were reported and therefore it is not known when the specimen was taken in relation to symptom onset. Both cases had one dose of MMR vaccine. Neither of the cases had an epidemiological link to any known cases so these cases are unlikely to be rubella.

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 19th August 2016. These figures may differ slightly from those published previously due to ongoing updating of data on CIDR.

WHO require information on discarded rubella cases ie rubella cases investigated and who were found not to meet the case definition. The HSE Areas reported the number of discarded CIDR cases to HPSC. For 2015, 21 cases were discarded from CIDR as following investigation they were not considered to be rubella cases. Discarded cases are not available in CIDR for reporting and are therefore not included in the analysis above.

The Regional Verification Commission for Measles and Rubella Elimination (RVC) was established in the WHO European Region in 2011 to evaluate the documentation submitted by Member States with a view to verifying the elimination of measles and rubella at the regional level. The WHO Regional Office serves as the secretariat to the RVC.[1]

The RVC comprises public health experts, including epidemiologists, clinicians and virologists. It includes a chairperson, a vice-chairperson and a maximum of eight additional members, all of whom are independent of the managerial and operational aspects of elimination activities. The RVC works in close collaboration with the WHO Regional Office for Europe, and reports to the WHO Regional Director for Europe. Its main task is to provide periodic updates to, and coordinate technical and policy issues with, the European Technical Advisory Group of Experts.[1]

The RVC has recommended establishment of national verification committees (NVC) in all Member States and suggested a standard format for annual status reports from countries. These reports include information on measles and rubella epidemiology, virologic surveillance supported by molecular epidemiology, the analysis of vaccinated population cohorts and the quality of surveillance, and the sustainability of the country's National Immunisation Programme.[1]

The review and evaluation of annual national reports will continue for at least three years after the RVC confirms that, according to established criteria, endemic measles and rubella transmission have been interrupted in all Member States of the Region. Only then can Regional elimination be declared.[1]

Based on the data provided by the Irish National Verification Committee in 2014 to the WHO RVC the RVC concluded that endemic transmission of rubella remained interrupted in Ireland in 2014. In view of the reported data for the period 2012-2014, the RVC declared rubella eliminated in Ireland.[2]

References

1. WHO. Regional Verification Commission for Measles and Rubella Elimination (RVC). Available at http://www.euro.who.int/en/health-topics/communicable-diseases/measles-and-rubella/activities/regional-verification-commission-for-measles-and-rubella-elimination-rvc.
2. WHO. 4th Meeting of the European Regional Verification Commission for Measles and Rubella Elimination (RVC). Available at http://www.euro.who.int/__data/assets/pdf_file/0011/304958/4th-RVC-meeting-report.pdf?ua=1.

1.8 *Streptococcus pneumoniae* (invasive)

Summary

Number of confirmed cases in 2015: 368
Number of confirmed cases in 2014: 350
Number of deaths in 2015: 37
Number of deaths in 2014: 37
Crude incidence rate of confirmed cases in 2015: 8.0/100,000

Background

Invasive *Streptococcus pneumoniae* infection is a notifiable disease in Ireland; clinicians and laboratories are legally obliged to notify this infection. For the purposes of this report the term invasive pneumococcal disease (IPD) will be used to describe these infections. IPD includes meningitis and bloodstream infection (BSI) with and without pneumonia.

A number of different initiatives are in place in Ireland for the surveillance of IPD. Data on IPD notifications are collated in the Computerised Infectious Disease Reporting (CIDR) system. Enhanced surveillance of IPD notifications is undertaken by Departments of Public Health. A separate surveillance strand (EARS-Net project) involving the microbiology laboratories and HPSC is used to monitor in detail the antimicrobial resistance profiles of invasive *S. pneumoniae* isolates from blood and/or CSF. EARS-Net laboratories can also collect additional information, including risk factors, admission and outcome for each *S. pneumoniae* isolate reported and these data are collated by HPSC through the Enhanced Surveillance of Bloodstream Infection (ESBSI) system. To improve data quality regular processes for cross-checking CIDR data with other data sources was established in 2012; CIDR data are linked to the typing and ESBSI databases and additional information on either of these systems but missing or incomplete in CIDR is collated on an annual basis.

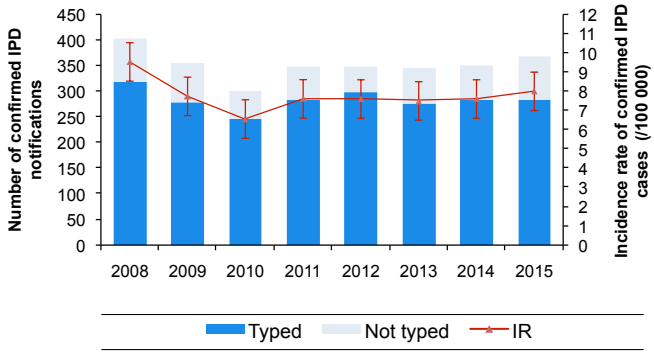

Figure 1. Number of confirmed invasive pneumococcal disease (IPD) notifications by typing status and the incidence rate (IR) of confirmed IPD with 95% confidence intervals, 2008-2015
Data source: CIDR

Since April 2007, the Irish Pneumococcal Reference Laboratory has provided a typing service to Irish laboratories for all invasive *S. pneumoniae* isolates. This is a collaborative project involving the Royal College of Surgeons in Ireland/ Beaumont Hospital, the Children's University Hospital, Temple Street and HPSC. In addition, since August 2012 HPSC has participated in a European Centre for Disease Prevention and Control (ECDC) project called SpIDnet and since 2015 HPSC has joined the ECDC project I-MOVE plus. Both projects aim to strengthen or set up long term active population-based IPD surveillance in order to estimate the impact of the pneumococcal conjugate vaccines in children less than five years of age, in those aged 5-64 years of age and in adults aged 65 and over in Europe.

In September 2008, the 7-valent pneumococcal conjugate vaccine (PCV7) was introduced into the Irish infant immunisation schedule at 2, 6 and 12 months of age. A catch-up campaign was also implemented at that time, targeting children <2 years of age. In December 2010, PCV13 replaced PCV7 in the infant schedule. Uptake of three doses of PCV by 24 months of age for 2015 was 93%.

Notification data for IPD was extracted from CIDR on 30th May 2016. These figures may differ slightly from those previously published due to ongoing updating of notification data on CIDR. For the 2012- 2014 notifications, the 2012 HPSC case definition for IPD was used. In brief, isolation or detection of *S. pneumoniae* from a normally sterile site was classified as confirmed; detection of *S. pneumoniae* antigen from urine was classified as a possible case. Since 2012, the previously used probable case definition is no longer applicable and any case in which *S. pneumonia* antigen was detected from urine (previously defined as a probable case) was classified as possible, and antigen detection from a sterile site was categorised as confirmed. Since July 2015, the case definition of *S. pneumoniae* was amended and only those cases of IPD meeting the laboratory criteria for laboratory confirmed are now notifiable and urinary antigen detection (possible cases) are no longer notifiable.

Results

All IPD notifications

In 2015, 549 cases of IPD (12.0/100,000) were notified in Ireland, a decrease compared with 2014 (681 cases; 14.8/100000). This decrease is related to a decrease in the number of possible cases notified in 2015 in comparison to 2014 due to definition changes.

In 2015, 67% (n=368) of notifications were classified as confirmed and 33% (n=181) as possible. The majority of possible cases (83%) were notified by HSE E, HSE SE and HSE MW (n=47/181; n=59/181 and n=44/181, respectively).

Confirmed IPD notifications

Focusing specifically on the confirmed IPD notifications, 368 cases were notified in 2015 (8.0/100,000; 95% CI 7.2 - 8.8/100,000), a slight increase in the number of cases was observed compared with 2014 (7.6/100,000; 95% CI 6.8 - 8.4/100,000; 350 cases) (Figure 1). In 2015, the incidence of confirmed IPD decreased by 20% compared with 2008 (9.5/100,000; 95% CI 8.6 – 10.5/100,000; 404 cases; p<0.05) (Figure 1).

In 2015, 77% of the confirmed IPD notifications had an isolate submitted for serotyping, less than the proportion of cases in 2014 (81%) and in 2013 (80%), but similar to the proportions reported in 2008 and 2009 when 79% of notifications had an isolate typed. In 2012, 86% of all isolates were typed (Figure 1). In 2015, 37% of notifications (13/35) relating to children <5 years of age did not have an isolate submitted for serotyping. For two of the 13 cases IPD was confirmed by PCR only and no isolate was available. For the remaining eleven isolates from a sterile site, no sample was available for typing.

Incidence rates by HSE area ranged from 5.8 per 100,000 in HSE W to 8.8 per 100,000 in HSE E, with the highest incidence in the HSE MW, HSE S and HSE-SE (Figure 2). However, the incidence rates in each of the eight HSE areas were not statistically different from the national one.

In 2015, a clinical diagnosis was reported for 229 of the 368 confirmed cases (62%), which included BSI with pneumonia (n=163), meningitis (n=29), and other BSI for the remainder (n=37). This reflects an improvement in completeness of data provided in comparison to 2014, when clinical diagnosis was reported for 168 of the 350 confirmed cases (48%), 14% less than in 2015.

More cases occurred in males (n=194, 53%) than in females. Cases ranged in age from 1 month to 99 years, with an average age of 57.3 years (median age 65.5 years). Those aged 65 years and older accounted for half of the cases (51%, n=189). The age specific incidence rate (ASIR) was highest in those 85 years of age and older (77.0/100,000; n=45), followed by those in the 75-84 years age group (40.7/100,000; n=70) and the 65-74 year age group (24.3/100,000; n=74) (Figure 3). In children <2 years of age the ASIR was 13.1 cases per 100,000 population (n=19). A statistically significant decline (60%) in IPD incidence was seen in this age group when compared with 2008 (42/100,000; n=52; p<0.0001), highlighting the positive impact of the introduction of PCV7 in September 2008 to the infant schedule followed by PCV13 in December 2010 (Figure 3).

The medical risk factor field was completed for 178 (48%) confirmed cases; 37 cases (16%) did not have an identified risk factor; for the remaining 131 cases this information was either unknown or not specified. Based on the 178 cases for whom this information was reported, 144 (81%) of them had an underlying medical risk factor, with some patients having multiple risk factors. The main medical risk factors reported included immunosuppressive condition or therapies (n=58; 40.3%), chronic lung disease (n=59; 41%), chronic heart disease (n=64; 44.4%), chronic liver disease (n=15; 10.4%) and renal diseases (n=21; 14.6%). It should also be noted that being aged 65 years and older was also a recognised IPD risk factor; 189 (51%) cases in 2015 were in this age group. Apart from their age, 103 (54%) cases in this age group also had a reported medical risk factor.

IPD death notifications

Outcome was reported in 56% (n=309) of the IPD notifications in 2015 versus 39% in 2014. Therefore, these figures may not accurately estimate the burden of IPD in terms of mortality. Based on the data available in 2015, 41 deaths in individuals with IPD were reported; for seven cases the cause of death was reported as directly due to IPD, not due to IPD in four cases and for the remaining 30, the cause of death was not specified or was unknown. Forty deaths occurred in adults, ranging in age from 50-99 years and one in an infant three months of age. Forty deaths were in confirmed cases.

The apparent increase in IPD death notifications in 2012-2015 (41 cases in 2015 and also in 2014, 24 cases in 2013 and

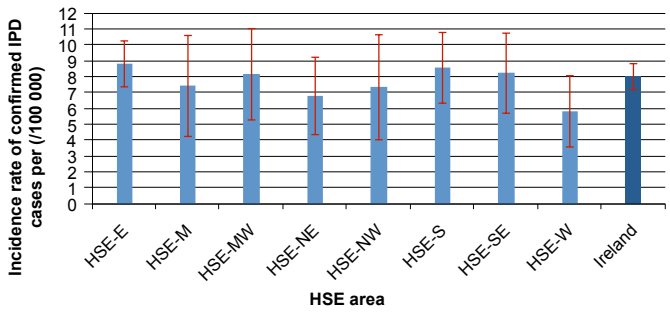

Figure 2. Crude incidence rate of confirmed invasive pneumococcal disease notifications by HSE area, 2015
Data source: CIDR

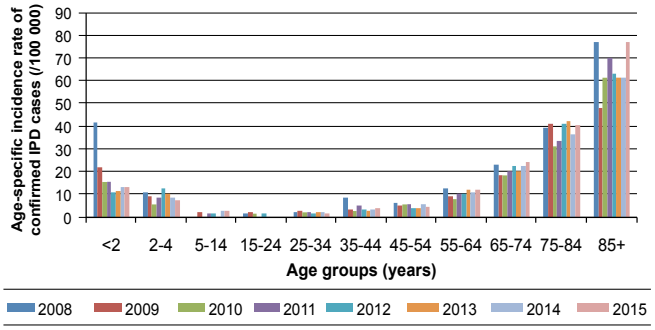

Figure 3. Age specific incidence rate of confirmed invasive pneumococcal disease notifications by age group, 2008-2015
Data source: CIDR

37 cases in 2012 versus 11 cases in 2011) is most likely related to the additional information that was available by linking CIDR data to the Enhanced Surveillance of Blood Stream Infections (ESBSI) database. Using BSI data it was possible to identify missing information on outcome in CIDR and then the CIDR database was updated by HSE areas.

Impact of pneumococcal conjugate vaccines (PCV)

Data from the National Pneumococcal Typing Laboratory were used to assess the impact of introducing PCV on the distribution of *S. pneumoniae* serotypes associated with IPD and on the burden of IPD in Ireland. In 2015, of the 368 confirmed IPD notifications reported in CIDR, 283 had isolates sent for typing (77%). Two percent of IPD infections were due to serotypes covered by PCV7 (4, 6B, 9V, 14, 18C, 19F and 23F), 26% were associated with the six additional serotypes included in PCV13 (1, 3, 5, 6A, 7F and 19A) and the remaining 72% of infections were due to non-vaccine types (NVTs).

Since introducing PCV7 to the Irish childhood immunisation schedule towards the end of 2008, there has been a 20% reduction in the overall burden of IPD disease. Reductions in the incidence of IPD due to PCV7 serotypes have been seen in all age groups (Figure 4a). Overall, the incidence of IPD due to PCV7 serotypes has significantly declined in 2015 compared with 2008 (99% decline, $p<0.001$). The greatest impact has been seen in children <5 years of age where the incidence due to PCV7 serotypes has declined by 100% ($p<0.001$) (Figure 4a). In 2015 the incidence of disease due to the additional six serotypes covered by the PCV13 declined by 60% in children <2 years of age compared with 2008 (Figure 4b). The decline was also observed in the other age groups with these additional six serotypes compared with 2008; however, this decline was not significant (Figure 4b). An increase in incidence due to NVTs was also seen in 2015 compared with 2008. In those aged 65 years and older, an increase in incidence was observed in 2015 compared with 2014. There has been little change in the incidence of NVTs among other age groups (Figure 4c).

The predominant serotypes in circulation in 2015, were 8 (NVT), 19A, 7F and 3 (all included in PCV13) and followed by serotypes and 12F and 22F (both NVT). In children <5 years of age, the predominant serotypes were 19A (included in PCV13), 12F, 15A, 23B, 12A and 15B/C (all NVTs); all these serotypes accounted for 91% of the isolates serotyped in this age group (Figure 5).

For ongoing updates, see "Slides – Impact of PCV in Ireland" at http://www.hpsc.ie/A-Z/VaccinePreventable/PneumococcalDisease/PostersPresentations/

PCV vaccine failures

Based on data obtained through the IPD enhanced surveillance system, two PCV vaccine failures were reported in 2015, both due to serotype 19A (PCV 13). Since 2008, a total of 11 vaccine failures have been reported in addition to the two reported in 2015, two in 2014 (19A), three in 2013 (19A), two in 2012 (19F and 19A) and two in 2010 (19F and 14).

Penicillin non-susceptible *S. pneumoniae* (PNSP)

In 2015, the proportion of penicillin non-susceptible invasive *S. pneumoniae* (PNSP) was 17.5%, (0.3% and 17.2% with high and intermediate level resistance, respectively) while

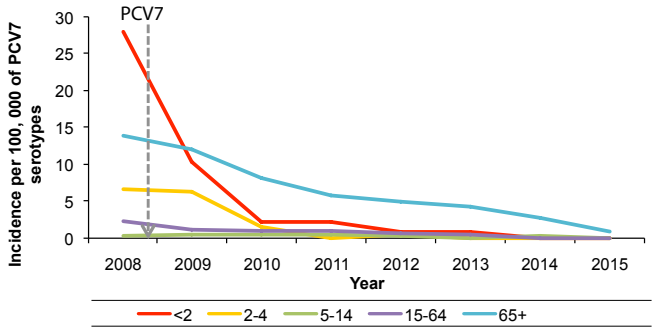

Figure 4a

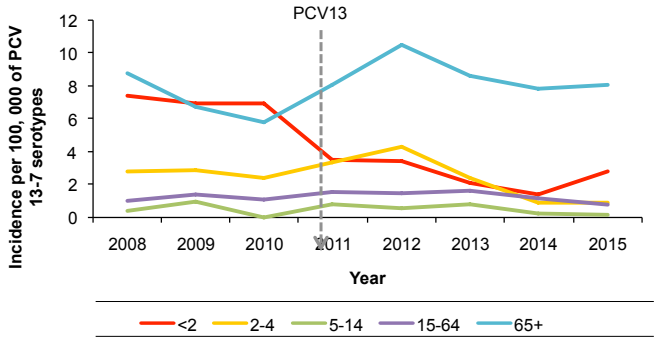

Figure 4b

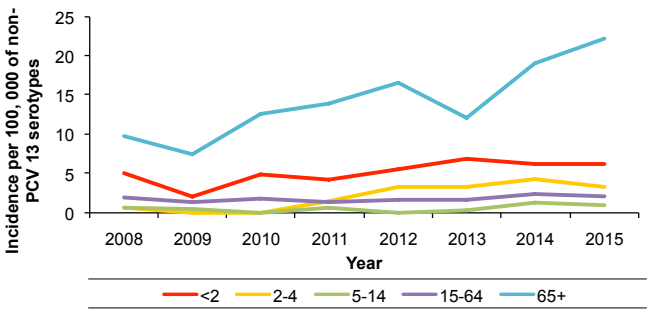

Figure 4c

Figure 4. Age specific incidence rate by age group of confirmed invasive pneumococcal disease cases due to (a) PCV7 serotypes, (b) the additional six serotypes covered by PCV13 and (c) non-vaccine types, 2008-2015.
Data source: Irish Pneumococcal Reference Laboratory

15.2% of isolates were resistant to erythromycin (Data source: HPSC/EARS-Net Ireland). This compares to 17.1% and 13.8% in 2014, respectively. In 2015, the proportion of PNSP increased slightly compared to 2014, but the overall trend for the past 3 years has been downward. In 2015, the proportion of *S. pneumoniae*
with resistance to erythromycin increased compared to 2014, but the overall trend for the past four years has been downward.

The predominant PNSP serotypes in 2015 were 8, 19A and 12F whereas in 2008 serotypes 9V and 14 were the predominant serotypes associated with PNSP. For details on the antimicrobial resistance patterns of *S. pneumoniae*, please see the link on EARS-Net Report, Quarters 1-4 2015: http://www.hpsc.ie/A-Z/MicrobiologyAntimicrobialResistance/EuropeanAntimicrobialResistanceSurveillanceSystemEARSS/EARSSSurveillanceReports/2015Reports/

Discussion

Although there was slight increase in the incidence of confirmed cases of IPD in Ireland in 2015 compared with 2014, since vaccine introduction in 2008, PCV7 has had a significant impact in reducing the overall burden of the disease in the total population. There has been a decline in IPD in all age groups due to serotypes covered by PCV7, indicating the indirect/herd immunity effect the vaccine confers on the population. The greatest impact has been in children <5 years of age where disease incidence due to PCV7 serotypes has fallen by over 100%. The impact due to the additional six serotypes covered by PCV13 vaccine was observed in children <2 years of age, amongst whom the reduction in the incidence of disease was 60%.

However, despite reductions in the IPD burden during childhood, the incidence of disease due to non-PCV7 serotypes has increased in other age groups. There has been a shift in the prevalent serotypes associated with invasive disease. Serotypes 8, 19A and 7F were the predominant serotypes identified in 2015.
Ireland (HPSC) is participating in ECDC funded projects, SpIDnet (since 2012) and I-Move plus (since 2015).

Participation in these projects allows the strengthening of the IPD surveillance system in Ireland. As part of SpIDnet project since January 2013 enhanced surveillance was extended to all children and adolescents aged <15 years of age and since December 2014 enhanced surveillance was undertaken in one of the HSE regions on all adult IPD cases particularly focusing on data collection for clinical presentation, risk factor, outcome and vaccination history. This approach has improved data quality, completeness and timeliness. All HSE regions are striving to improve the quality of enhanced data collection for all cases (paediatric and adults).

To accurately assess the impact of PCV on immunisation programmes and to monitor for vaccine failures in Ireland, it is crucial that samples from sterile sites are obtained for culture and sensitivity. Isolates obtained by culture are required for serotyping and antibiotic susceptibility. Furthermore it is crucial that laboratories continue to send all invasive *S. pneumoniae* isolates for typing to the National Pneumococcal Typing Laboratory. Although 77% of confirmed notifications had an isolate submitted for serotyping in 2015, 23% (n=85) did not, including 13 cases in children <5 years of age. In two of these 13 cases, an isolate was not available for typing and confirmation was by PCR only. Serotype information is unavailable for 37% of confirmed notifications in this age group and the absence of this data is of concern.

Continued good quality IPD surveillance including the monitoring of invasive *S. pneumoniae* serotypes is crucial in identifying any epidemiological changes in the disease, in assessing the impact of PCV13 on public health and in guiding further vaccination strategies, as newer expanded valency vaccines become available and changes to recommendations of PCV are made e.g. age related. For example, due to the incomplete data we do not know the impact of IPD on mortality and this is a key metric in assessing the true impact of this disease and the effectiveness of interventions, including new vaccines.

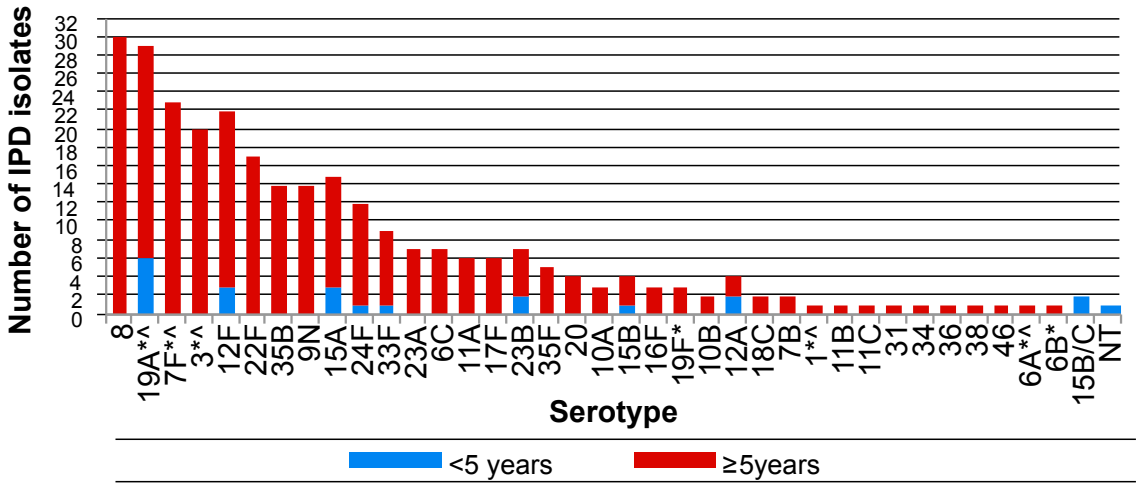

Figure 5. Serotype distribution of invasive Streptococcus pneumoniae isolates by age group (years) in Ireland, 2015
** Denotes serotypes included in PCV7*
**^ Denotes additional six serotypes included in PCV13 (PCV13-7)*
Data source: Irish Pneumococcal Reference Laboratory

1.9 Tetanus

Summary

Number of cases, 2015: 1
Number of cases, 2014: 1

Tetanus is a rare disease in Ireland since the introduction of tetanus vaccines in the 1930s. However, cases still occur.

One case of non-fatal tetanus was notified in 2015. The case was in the age group 35-44 years and was classified as confirmed. It was not known if the case had ever received any tetanus vaccinations. The case developed paralysis with muscle spasms days after injecting heroin ("skin popping"). The case was on a ventilator for 12 days.

Summary of case data since 1981:
Sixteen cases of tetanus were reported since tetanus became notifiable in November 1981. The number of tetanus cases notified by age group is shown in figure 1. Two deaths were reported, both cases were aged >60 years.

Of the 16 tetanus cases, nine (56%) were male, five (31%) were female while gender was unreported for two (13%).

The following wound injuries (n=11) were reported among the 16 notified cases: wound injuries from a road traffic accident (n=1), wound from a fall outdoors (n=1), wound associated with a dog bite (n=1), wound from a kitchen knife (n=1), gardening associated leg wound (n=1), leg scratches in an avid gardener (n=1), hand wound associated with a clean piece of wood (n=1), a farming associated hand wound (n=1), a foot wound from a thorn (n=1), hand injuries from a can and a rusty nail (n=1) and, as mentioned above, in the case reported in 2015 the case developed paralysis with muscle spasms days after injecting heroin (n=1). An additional case was reported having a discharging wound on a toe one week prior to onset of tetanus symptoms developing, however, the cause of the wound was not reported.

Vaccination data were reported for six of the 16 cases. Two cases, in the age groups 10-14 years and 20-24 years, were unvaccinated. One case, in the age group 15-19 years, was reported to have received three doses of tetanus vaccine as a child and a booster at four years and again at five-six years of age. One case was reported to have received a single tetanus vaccine around 40 years prior to infection. One case was reported as having received one dose of a tetanus vaccine 20 years earlier but it was not known if the case had received any previous doses (ie primary tetanus vaccines as an infant). One case (age group 15-19 years) was reported as having received one dose of a tetanus vaccine as an infant and a dose when they were two years of age.

Vaccine efficacy after a complete series of vaccines (five doses) is almost 100%. However, immunity wanes and after 10 years may be insufficient to provide protection. The

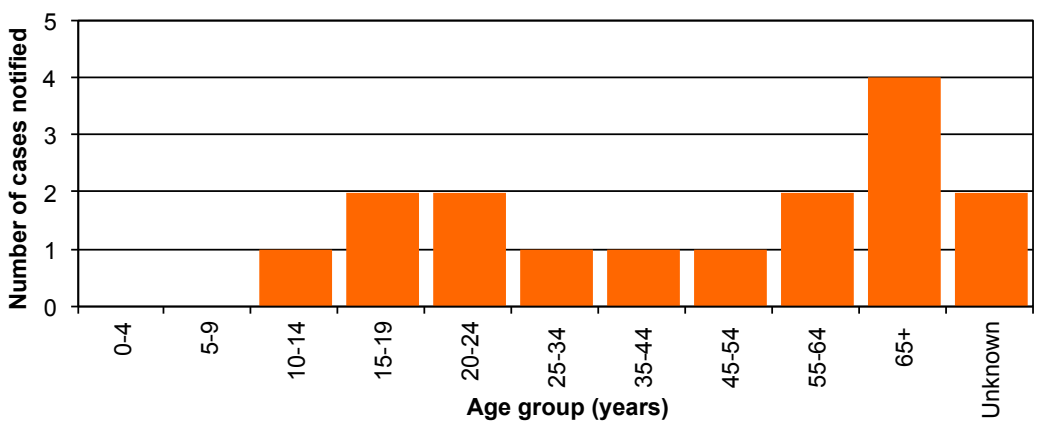

Figure 1. Tetanus cases notified (n=16) from November 1981 to 2015 by age group

childhood immunisation schedule in Ireland recommends children receive a dose of tetanus toxoid containing vaccine at two, four and six months of age and booster doses at four-five years of age and 11-14 years of age. For vaccinated persons who have received five doses of tetanus toxoid, booster doses may be considered every 10 years. This is based on concern regarding the decline of antibody levels with age and potential failure of single booster doses to produce protective levels in older individuals. For more complete and detailed information on recommended tetanus immunisations please see the HSE National Immunisation Office website at www.immunisation.ie.

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 27th May 2016. These figures may differ from those published previously due to ongoing updating of notification data on CIDR.

2015

ANNUAL EPIDEMIOLOGICAL REPORT

02

RESPIRATORY AND DIRECT CONTACT DISEASES

2.1 Influenza and Other Seasonal Respiratory Viruses

2015/2016 influenza season summary:

Peak influenza-like illness rate: 80.6/100,000 population
Total confirmed influenza cases hospitalised:1856
Total confirmed influenza cases admitted to ICU: 161
Total notified influenza cases that died: 84
Total number of acute respiratory infection and influenza outbreaks: 63

HPSC has worked in collaboration with the National Virus Reference Laboratory (NVRL), the Irish College of General Practitioners (ICGP) and the Departments of Public Health on the influenza sentinel surveillance project since 2000. During the 2015/2016 influenza season, 61 general practices (located in all HSE-Areas) were recruited to report electronically, on a weekly basis, the number of patients who consulted with influenza-like illness (ILI). Sentinel GPs were requested to send a combined nose and throat swab to the NVRL on one ILI patient per week. The NVRL also tested respiratory non-sentinel specimens, referred mainly from hospitals.

Other surveillance systems set up to monitor ILI/influenza activity include:

- Surveillance of all calls to GP out-of-hours (OOHs) centres, monitored for self-reported influenza. These data were provided by HSE-NE.
- Surveillance of all confirmed influenza notifications, including hospitalisation status reported to the Computerised Infectious Disease Reporting System (CIDR) in Ireland.
- Enhanced surveillance of hospitalised influenza cases aged 0-14 years.
- Intensive Care Society of Ireland (ICSI) and the Critical Care Programme (CCP) enhanced surveillance of all critical care patients with confirmed influenza
- Surveillance of all reported influenza deaths.
- All-cause mortality monitoring associated with the European mortality monitoring group (EuroMOMO)
- A network of sentinel hospitals reporting admissions data.
- Outbreak surveillance – Acute respiratory infections and influenza
- Influenza vaccine effectiveness study (I-MOVE)

This report summarises influenza and other seasonal respiratory virus activity in Ireland during the 2015/2016 influenza season. The 2015/2016 season commenced on 28th September 2015 (week 40 2015) and ended on 22nd May 2016 (week 20 2016). The data presented in this summary were based on all data reported to HPSC by the 28th November 2016.

Sentinel GP Clinical Data
Influenza activity reported from the sentinel GP network in Ireland was at moderate levels during the 2015/2016 influenza season, with ILI consultation rates peaking at 80.6 per 100,000 population during week 4 2016 (late January), the highest peak rate since the 2010/2011 season. ILI rates first increased above baseline levels (17.9 per 100,000) during week 1 2016 and remained there for 10 consecutive weeks, which is the average length of time above baseline in Ireland. ILI rates were above medium intensity levels for five consecutive weeks (figure 1). The highest age specific ILI rates were reported in the 5-14 year age group (peaking at 131.6/100,000), followed by the 0-4 year age group (112.9/100,000), the 15-64 year age group (81.7/100,000) and those aged 65 years and older (69.1/100,000). It is notable that the age specific rates in the 0-4, 5-14 and 15-64 year age groups were the highest reported in these age groups since the 2010/2011 season. Age specific rates in those aged 65 years and older were the highest reported since the 2008/2009 season and were only higher during the 2003/04 season.

Virological Data from National Virus Reference Laboratory (NVRL) – Influenza
Sentinel GP data: The NVRL tested 1158 sentinel specimens for influenza virus during the 2015/2016 season. Five hundred and seventy-three (49.5%) sentinel specimens were positive for influenza: 329 influenza A (313 A(H1)pdm09, 6 A(H3) and 10 A not subtyped) and 244 influenza B. Fifty seven percent of all confirmed influenza sentinel cases were positive for influenza A and 43% for influenza B. Of subtyped influenza A specimens, 98% were positive for influenza A(H1) pdm09. Overall, 89% (968/1088 with known vaccination status) of ILI patients tested for influenza were not

vaccinated with the 2015/2016 seasonal influenza vaccine. Sixty-four percent of those aged 65 years and older were not vaccinated and 76% of those aged less than 65 years with a known risk factor for influenza were not vaccinated. Fifteen ILI patients were reported as having commenced antiviral treatment.

Non-sentinel data: The NVRL tested 11,362 non-sentinel respiratory specimens during the 2015/2016 season, 1694 (14.9%) of which were positive for influenza: 1130 influenza A (1023 A(H1)pdm09, 42 A(H3), and 65 A (not subtyped)) and 564 influenza B. Sixty-seven percent of all confirmed influenza non-sentinel cases were positive for influenza A and 33% were positive for influenza B. Of subtyped influenza A specimens, 96% were positive for influenza A(H1)pdm09.

Influenza A(H1)pdm09 was the predominant influenza virus circulating during the 2015/2016 season, co-circulating with influenza B throughout the season. Influenza A accounted for 64% of all influenza positive specimens and influenza B for 36%. Of the 1384 influenza A sentinel and non-sentinel specimens that were subtyped, influenza A(H1)pdm09 accounted for 96.5% and influenza A(H3) for 3.5%. In total 1336 positive influenza A(H1)pdm09 cases were detected by the NVRL during the 2015/2016 season, this is the highest number of A(H1)pdm09 viruses detected since the 2010/2011 season.

Influenza virus characterisation:
For the 2015/2016 influenza season, genetic and antigenic characterisation of influenza viruses circulating in Ireland was carried out by the NVRL on 122 positive samples: 83 A(H1)pdm09, 9 A(H3), and 30 B. All influenza A(H1N1) pdm09 viruses genetically characterised belonged to the genetic group A/South Africa/3626/2013 (subgroup 6B). All influenza A(H1)pdm09 viruses successfully isolated and antigenically characterised by the NVRL during the 2015/2016 season were similar to the 2015/2016 A(H1) pdm09 vaccine strain A/California/07/2009. Nine influenza A(H3) viruses were genetically characterised, all belonged to the genetic group A/Hong Kong/4801/2014 (3C.2a), which is a genetic group of viruses that was antigenically similar to the 2015/2016 influenza A(H3) vaccine strain. One of 30 influenza B viruses genetically characterised during the 2015/16 season belonged to the genetic group B/Phuket/3073/2013 (Yamagata lineage clade 3); this virus was also successfully isolated and antigenically characterised as being similar to the 2015/16 trivalent influenza vaccine strain B/Phuket/3073/2013. The majority (29 of 30; 96.7%) of influenza B viruses genetically characterised belonged to the genetic group B/Victoria/2/87 (clade 1A). The vast majority of influenza B viruses successfully isolated and antigenically characterised by the NVRL during the 2015/2016 season were similar to the B/ Brisbane/60/2008-like virus. The B/Brisbane/60/2008-like virus (a B/Victoria virus) was not present in the 2015/2016

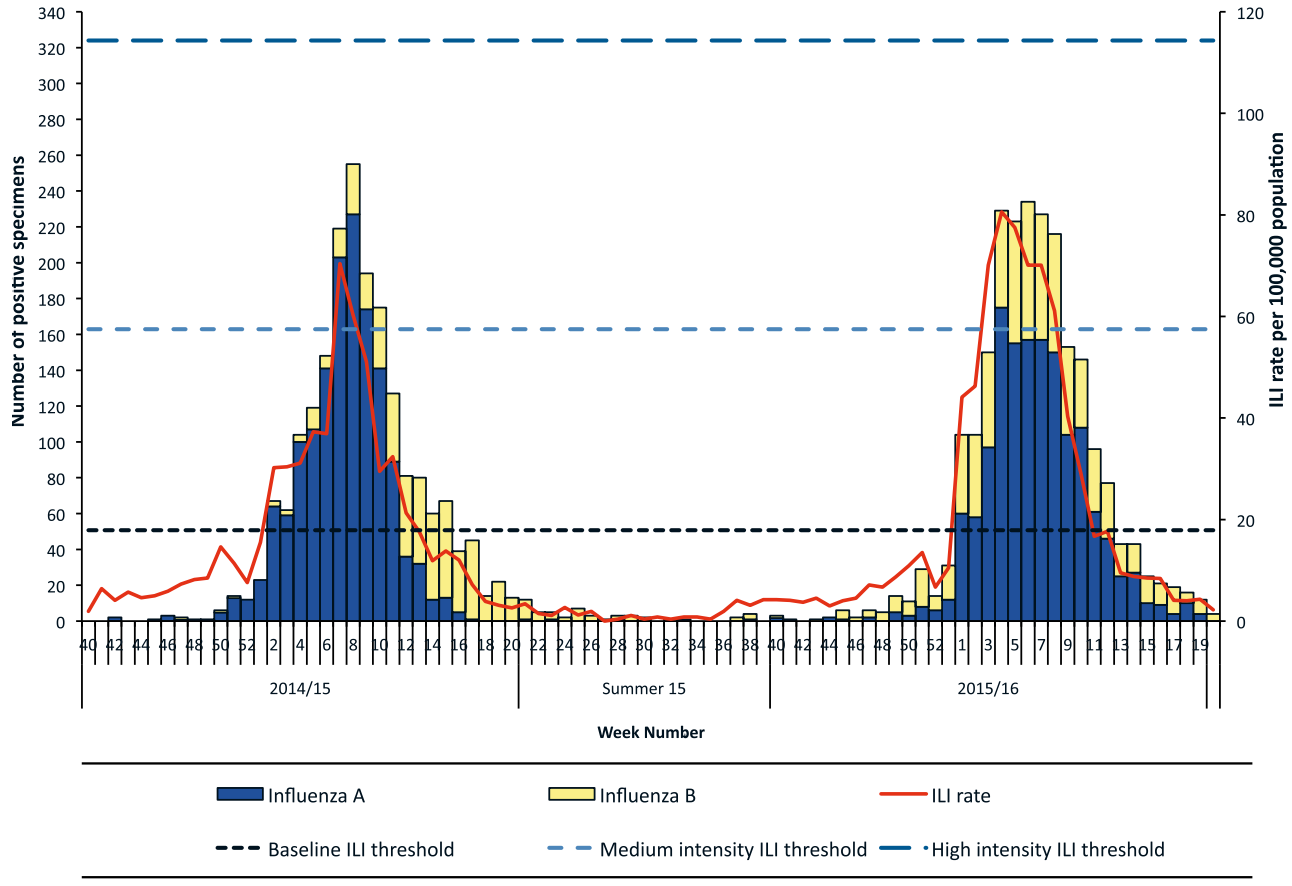

Figure 1: ILI sentinel GP consultation rates per 100,000 population, baseline ILI threshold, medium and high intensity ILI thresholds1 and number of positive influenza A and B specimens tested by the NVRL, by influenza week and season.
Source: Clinical ILI data from ICGP and virological data from the NVRL.

[1] For further information on the Moving Epidemic Method (MEM) to calculate ILI thresholds: http://www.ncbi.nlm.nih.gov/pubmed/22897919

trivalent influenza vaccine used in Ireland and throughout most of Europe.

Virological Data from NVRL - Other seasonal respiratory viruses

During the 2015/2016 season, of 11,362 non-sentinel specimens tested by the NVRL, 951 (8.4%) positive detections of respiratory syncytial virus (RSV) were reported, peaking (at 33.8% positivity) during week 50 2015. A total of 199 (1.8%) positive detections of human metapneumovirus (hMPV) were reported, peaking during mid-December 2015. One hundred and fifty-eight (1.4%) positive detections of adenovirus were reported, peaking in mid-February 2016. Sixty-five (0.6%) parainfluenza virus type 1 (PIV-1), 29 (0.3%) PIV-2, 59 (0.5%) PIV-3 and 19 (0.04%) PIV-4 positive detections were reported during the 2015/2016 season. Positive detections of RSV, adenovirus and parainfluenza virus type 1 reached the highest numbers ever reported by the NVRL for any season.

Of the 1158 sentinel specimens tested during the 2015/2016 season, 27 (2.3%) were positive for RSV, 16 (1.4%) for hMPV, 13 (1.1%) for adenovirus, six (0.5%) PIV-1, one (0.2%) PIV-2, and two (0.2%) PIV-4. There were no positive detections of PIV-3 from sentinel sources during the 2015/2016 season.

Outbreaks, GP OOHs & sentinel hospital data

Thirty-six confirmed influenza general outbreaks were reported to HPSC during the 2015/2016 influenza season (table 1), a significant decrease compared to 90 reported during the 2014/2015 season. The majority of influenza outbreaks reported during the 2015/16 season were associated with influenza A(H1)pdm09. Thirty outbreaks were associated with influenza A (27 A(H1)pdm09 and 3 A - not subtyped) and five with influenza B. No influenza type/subtype was reported for one outbreak. Twenty-one confirmed influenza outbreaks were reported from community hospitals/residential care facilities, 13 from acute hospital settings and two from schools. In total four deaths were recorded as associated with these 36 outbreaks. It is probable that the actual number of deaths linked with these outbreaks exceeds this number. A further 27 acute respiratory infection (ARI) general outbreaks were reported during the 2015/2016 influenza season, eight were associated with RSV, two with hMPV, two with parainfluenza type 1, one with rhinovirus and 14 associated with unidentified pathogens. For all ARI and influenza outbreaks, vaccination status was reported for patients from 14 healthcare facilities/residential institutions, with over 92% (466/507) of patients vaccinated prior to these outbreaks. Vaccination status was reported for staff from only six healthcare facilities/residential care facilities, with only 7% (17/244) of staff reported as vaccinated prior to these outbreaks. Use of antivirals for treatment in healthcare settings was reported from 11 ARI/influenza outbreaks (of 17 outbreaks that reported data) and use of antivirals for chemoprophylaxis was reported from seven ARI/influenza outbreaks (of 14 outbreaks that reported data).

The percentage of influenza-related calls to GP out-of-hours services in Ireland, peaked during week 5 2016 (the first week in February) at 5.1%, one week later than the peak in sentinel GP ILI consultation rates. The peak in influenza-related calls was the highest peak since the 2012/13 season. During the peak of activity, each service received on average, one call per hour relating to influenza.

Hospital respiratory admissions reported from a network of sentinel hospitals during the 2015/2016 season, peaked at 531 during week 51 2015, this is the highest peak level in recent years. The peak coincided with high levels of RSV activity and increasing influenza activity. Total emergency admissions reported from sentinel hospitals peaked during weeks 3-6 2016, coinciding with peak influenza activity. Total emergency admissions peaked at 3003 during week 3 2016.

Influenza and RSV notifications

A total of 4252 influenza notifications were reported on Ireland's Computerised Infectious Disease Reporting System (CIDR) during the 2015/2016 influenza season; the highest number of influenza notifications reported ever with the exception of the 2009 pandemic. Of the 4252 notifications, 4245 were confirmed cases, two were probable cases and five were possible cases. Of the 4245 confirmed influenza cases, 2072 (48.8%) were positive for influenza A(H1)pdm09, 30 (0.7%) for influenza A (H3), 559 (13.2%) influenza A (not subtyped) and 1584 (37.3%) influenza B. A total of 2078 RSV notifications were reported to HPSC during the 2015/2016 season; the highest number of notifications reported since RSV was made notifiable in 2012.

Confirmed influenza cases hospitalised

During the 2015/16 season, 1856 confirmed influenza cases (40.5/100,000 population) were reported as hospitalised; 44% of all confirmed influenza notified cases. The highest age specific rate in hospitalised cases for the 2015/2016 season was in those aged less than one year of age (150.5 per 100,000 population) which was the highest rate ever

Table 1: Number of influenza outbreaks by HSE-Area for the 2015/2016 influenza season (n=36).

HSE-Area	No. of outbreaks	Total number ill	Total number lab confirmed	Total number hospitalised	Total number dead
HSE-E	13	97	50	22	0
HSE-M	1	3	3	3	0
HSE-MW	4	41	19	14	1
HSE-NE	2	18	6	6	1
HSE-NW	4	64	19	12	2
HSE-SE	3	33	5	3	0
HSE-S	6	166	14	11	0
HSE-W	3	44	7	12	0
Total	**36**	**466**	**123**	**83**	**4**

reported in this age group, followed by those aged 1-4 years (130.7 per 100,000) (table 2). Of the 1856 hospitalised cases, 1223 (65.9%) were confirmed influenza A cases and 633 (34.1%) were influenza B cases. Of the 954 subtyped influenza A cases, over 99% were influenza A(H1)pdm09 and less than 1% were influenza A(H3). Further data on confirmed influenza hospitalised cases are detailed in tables 1-4.

Enhanced surveillance hospital data on 0-14 year age group
A total of 1445 confirmed influenza cases aged between 0 and 14 years were notified on CIDR for the 2015/2016 influenza season, 754 (52.2%) of these cases were hospitalised. Sixty percent (n=452) of hospitalised cases were positive for influenza A [346 A(H1)pdm09, 2 A(H3) and 104 A (not subtyped)] and 40% (n=302) were positive for influenza B. The median age of cases was 3 years. Over 63% of cases were aged between 0 and 4 years, with 15% of cases aged less than one year. The most frequently reported symptoms included: fever (59.2%), cough (48.5%) and fatigue (36.0%). Complications were reported for 476 (63%) cases; of these cases more than one complication was reported for 26.7% of cases. The most frequently reported complications included secondary bacterial pneumonia, primary influenza viral pneumonia and other respiratory complications. The median length of stay in hospital was 2 days (ranging from 1 - 56 days). Approximately, 29% of hospitalised cases in this age group were reported as belonging to a risk group for influenza, with chronic respiratory disease (including asthma), chronic neurological disease, congenital/chronic heart disease, immunosuppression, conditions that can compromise respiratory function and other medical conditions being the most frequently reported. Trisomy 21 was reported as a risk group for 12 cases. Five cases were reported as being premature. Of the 130 cases with reported underlying medical conditions and known vaccination status, 91% were *not* vaccinated. Approximately, 47% of cases (216/459) commenced antiviral treatment. Thirty-six cases were reported as being admitted to critical care units and seven children died (for further details, see below).

Confirmed influenza cases admitted to ICU
Of the 1856 hospitalised confirmed influenza cases reported during the 2015/16 influenza season, 161 (9%) were admitted to critical care (125 adults and 36 paediatric cases). Of the 161 critical care cases, 109 (68%) were infected with influenza A(H1)pdm09, 1 (0.6%) with influenza A(H3), 22 (14%) influenza A (not subtyped) and 29 (18%) with influenza B. Age specific rates for patients admitted to critical care units were highest in those aged less than one year (18.0 per 100,000 population), followed by those aged 65 years and older (7.7 per 100,000 population) (table 2). The overall median age of all cases was 51 years. The median age in years for paediatric cases was 3, and 58 for adult cases. One hundred and one (101/117, 86%) adults and 25 (25/34, 74%) paediatric cases had pre-existing medical conditions. The most frequently reported underlying medical conditions for adults were chronic respiratory disease (54/101, 54%), followed by chronic heart disease (46/101, 46%), and immunosuppression (26/101, 26%). Five adult cases were pregnant. Fifty-one (41%) adult cases were reported as current/former smokers and two (2%) adult cases were reported to have alcohol related disease. The most frequently reported underlying medical conditions for paediatric cases were neurological/neuromuscular conditions (15/25, 60%) and cardiovascular conditions (8/25; 32%). Ninety percent (112/125) of adults were ventilated during their stay in critical care units. Ventilation status was only reported for 13 paediatric cases; 11 (85%) of which were ventilated. The median length of stay in critical care for adult cases was 9 days (ranging from 1 - 139 days) and for paediatric cases 5 days (ranging from 1 - 35 days). Of the adult cases with known risk factors for influenza, 77% were not vaccinated. Of the 20 paediatric cases with known risk factors for influenza and known vaccination status, 95% were *not* vaccinated. Ninety-five percent of adult and paediatric cases were reported to have received antiviral therapy. Forty-two adult (42/125, 33.6%) and five paediatric (5/36 (13.9%) confirmed influenza cases admitted to critical care units during the 2015/2016 season died.

Mortality data
During the 2015/2016 influenza season, of the 4252 influenza cases notified, 84 (2%) cases were reported as having died. The case classification of influenza was

Table 2: Age specific rate for confirmed influenza cases hospitalised and admitted to critical care during the 2015/2016 influenza season. Age specific rates are based on the 2011 CSO census.

	Hospitalised		Admitted to ICU	
Age (years)	**Number**	**Age specific rate per 100,000 pop.**	**Number**	**Age specific rate per 100,000 pop.**
<1	109	150.5	13	18.0
1-4	371	130.7	14	4.9
5-14	274	44.0	7	1.1
15-24	86	14.8	2	0.3
25-34	184	24.4	6	0.8
35-44	164	21.7	22	3.2
45-54	119	20.5	22	3.8
55-64	152	32.8	34	7.3
≥65	397	74.2	41	7.7
Total	**1856**	**40.5**	**161**	**3.5**

confirmed for 83 of these cases and possible for one case. Of the 83 cases with known virology, 55 were associated with influenza A(H1)pdm09, 13 with influenza A (not subtyped) and 15 with influenza B. No influenza A(H3) associated deaths were reported. Influenza was reported as a cause of death (either on the death certificate or by the physician) for 56 cases. The median age of cases who died during the 2015/2016 influenza season was 65 years, ranging from 0-97 years. There was no significant cumulative excess all-cause mortality reported during the 2015/2016 season for the age groups monitored: 0-4, 5-14, 15-64 and 65 years and older.

Summary tables of confirmed influenza hospitalised and critical care cases and influenza-associated deaths for all ages are detailed in tables 3, 4 and 5.

Overview of the 2015/2016 season

In Ireland, the 2015/2016 influenza season was more severe than recent seasons. Influenza A (H1)pdm09 viruses predominated, co-circulating with influenza B. Only sporadic cases of influenza A (H3) were detected throughout the season. The 2015/2016 season was the first season since the 2009 pandemic and the 2010/2011 post-pandemic season that influenza A(H1)pdm09 viruses predominated in Ireland throughout the season. The impact of influenza during the 2015/2016 season affected all age groups, in particular younger age groups, with high hospitalisation and critical care admission rates and an increase in the number of notified influenza deaths reported. The number of confirmed influenza hospitalised cases (n=1856) reported during the 2015/2016 season, was the highest ever reported (data are available since 2009). Similarly, the number of critical care admissions was at the highest levels ever reported. There was a significant increase in the overall hospitalisation rate for those aged less than one year compared to previous seasons, reaching the highest rate (151/100,000 population) ever reported for this age group. Unlike the 2014/2015 season, when influenza A(H3) predominated, excess all-cause mortality was not reported in Ireland among people aged 65 years and older during the 2015/2016 season. Some countries in Europe reported excess mortality in the 15-64 year age group during the 2015/2016 season; this was not observed in Ireland.[1]

Sentinel GP ILI consultation rates in Ireland were above baseline levels for 10 consecutive weeks during the 2015/2016 season, which is the average length of time ILI rates remain above baseline in Ireland. ILI rates were at their highest levels since the 2010/2011 season. The NVRL reported the highest number of influenza A(H1)pdm09 viruses detected since the 2010/2011 season. RSV activity was high during the 2015/2016 season. Positive detections of adenovirus and parainfluenza virus type 1 reported by the NVRL, were at higher levels than are usually observed.

The number of acute respiratory infection and influenza outbreaks reported during the 2015/2016 season was lower than the previous season. The majority of these outbreaks were caused by influenza A(H1)pdm09 and mainly affected the elderly in residential care facilities. Reported influenza vaccination status of patients/clients in these outbreaks was high, whilst vaccination status of staff was low, highlighting the need to improve influenza vaccine uptake among health-

Table 3: Summary table of confirmed influenza cases hospitalised for all ages by influenza season: 2009-2016. Rates are based on the 2011 CSO census.

	Hospitalised						
	2009 pdm period	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Predominant flu type	**AH1pdm09**	**AH1pdm09; B**	AH3	B; AH3 & AH1pdm09	AH3; AH1pdm09	AH3; B	**AH1pdm09; B**
Total cases	1059	968	147	469	693	1009	1856
Crude rate /100,000	23.1	21.1	3.2	10.2	15.1	22.0	40.5
Median age (years)	17	29	27	32	51	59	30
Females	50%	55%	56%	57%	57%	53%	53%
Total deaths - all causes	25	42	6	22	34	47	75
Case fatality rate	2%	4%	4%	5%	5%	5%	4%

Table 4: Summary table of confirmed influenza cases admitted to critical care units for all ages by influenza season: 2009-2016. Rates are based on the 2011 CSO census.

	Admitted to ICU						
	Pandemic period	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Predominant flu type	AH1pdm09	AH1pdm09; B	AH3	B; AH3 & AH1pdm09	AH3; AH1pdm09	AH3; B	AH1pdm09; B
Total cases	100	121	15	39	83	69	161
Crude rate /100,000	2.2	2.6	0.3	0.8	1.8	1.5	3.5
Median age (years)	34	49	60	39	50	63	51
Females	50%	53%	80%	49%	41%	41%	42%
Cases with risk factor	82%	74%	93%	90%	85%	86%	83%
% Vaccinated	NA	17%	-	-	32%	47%	18%
ICU: Hospital ratio	9%	13%	10%	8%	12%	7%	9%
ICU Median LOS - Adult	12	14	5	9	9	9	9
ICU Median LOS - Paediatric	8	7	3	5	8	3	5
Total deaths - all causes	18	35	5	11	27	23	47
Case fatality rate	18%	29%	33%	28%	33%	33%	29%

care workers in order to reduce influenza-related morbidity and mortality. Further information on seasonal influenza vaccine uptake in hospitals and long term care facilities is available in the Immunisation Uptake chapter of the HPSC Annual Epidemiological Report, 2015. Only two influenza outbreaks in schools were reported during the 2015/2016 season. With levels of transmission of influenza amongst children high in community and hospital settings throughout the 2015/2016 season, it is likely that influenza outbreaks in schools were under-reported.

All influenza A(H1)pdm09 and A(H3) viruses characterised in Ireland during the 2015/2016 season belonged to genetic groups that were antigenically similar to the strains recommended for inclusion in the 2015/2016 trivalent influenza vaccines. The majority of influenza B viruses characterised during the 2015/2016 season in Ireland belonged to the B/Victoria lineage; these viruses were not present in the 2015/2016 trivalent vaccine used in Ireland and throughout most of Europe. Influenza A(H1N1)pdm09 viruses have evolved since 2009, with newly emerging subclades 6B.1 and 6B.2, reported worldwide during the 2015/2016 season. Despite this genetic evolution, most A(H1)pdm09 viruses remained antigenically closely related to the 2015/2016 A(H1N1)pdm09 vaccine virus. WHO has however recommended that trivalent vaccines for use in the 2017 southern hemisphere influenza season contain the influenza A(H1)pdm09 subclade 6B.1 virus.[1, 2, 3]

The Irish overall adjusted vaccine effectiveness (VE) estimates in preventing influenza confirmed infection in primary care for all influenza, influenza A(H1)pdm09 and influenza B and for all influenza in targeted patients were moderate for the 2015/2016 season. Despite the fact that B/Victoria viruses (not present in the trivalent influenza vaccine) were circulating in Ireland during the season, moderate protection against medically-attended laboratory confirmed influenza B presenting to general practice was observed, possibly due to cross protective immunity. The adjusted influenza VE estimate against A(H1N1)pdm09 (for all ages) was lower than for influenza B. Reasons for lower influenza A(H1N1)pdm09 vaccine estimates as of yet remain unclear and may possibly be due to the newly emerged influenza A(H1N1)pdm09 subclade 6B.1, although this subclade is not purported to have any changed antigenic properties.[1, 2, 3]

For the 2016/2017 influenza season in the northern hemisphere, WHO have recommended trivalent influenza vaccines contain the following strains: an A/California/7/2009 (H1N1)pdm09-like virus; an A/Hong Kong/4801/2014 (H3N2)-like virus; and a B/Brisbane/60/2008-like virus.[3] This represents a change in the influenza A(H3) and influenza B components compared with the composition of the Northern Hemisphere 2015/2016 influenza vaccine.

In Ireland, for the 2016/2017 season, existing surveillance systems are being further strengthened. HPSC are currently evaluating severe influenza surveillance systems, with a view to improving the efficiency of these systems and overall reporting of severe influenza cases for future seasons. A severe influenza surveillance working group has been established to review these evaluations and implement the required changes to improve severe influenza surveillance in Ireland. It is important to note the improvements in surveillance, reporting and testing when interpreting influenza surveillance data since the 2009 pandemic.

In light of the significant increase in notified influenza cases during the 2015/16 season, HPSC are currently conducting an influenza survey of all microbiology laboratories in Ireland. HPSC are also focusing on improving influenza vaccine uptake and antiviral data on severe influenza cases, outbreaks, health care workers and those in risk groups for influenza. HPSC, ICGP and the NVRL are continuing to work on the European influenza vaccine effectiveness study (I-MOVE project). Data from all of these surveillance projects will assist in guiding the management and control of influenza and of any future epidemics or pandemics. www.hpsc.ie

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Acknowledgements

HPSC would like to thank the sentinel GPs, ICGP, NVRL, Departments of Public Health, sentinel hospitals, ICSI and HSE-NE for their contributions towards influenza surveillance throughout the influenza season.

Table 5: Summary table of notified influenza cases that died from all causes and were reported on Ireland's Computerised Infectious Disease Reporting System (CIDR) by influenza season: 2009-2016. Rates are based on the 2011 CSO census.

	Influenza notifications - Deaths from all causes						
	Pandemic period	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Total deaths	32	43	12	38	58	66	84
Crude rate /100,000	0.7	0.9	0.3	0.8	1.3	1.4	1.6

2.2 Legionellosis

Summary

Number of cases in 2015: 12
Crude incidence rate: 2.6 per million

In 2015, there were 12 cases of Legionnaires' disease notified in Ireland, a rate of 2.6 per million population which is an increase from the rate of 1.7 per million observed in 2014. Three deaths due to Legionnaires' disease were reported among the 12 cases, giving a case fatality rate of 25%.

Eight cases were reported from HSE East, one from HSE Mid-West, one from HSE North West and two from HSE South.

Males and females were equally affected by Legionnaires' disease with half of all cases occurring in males and half in females. This was the second consecutive year since the reporting of cases to the national infectious disease surveillance system, CIDR that the majority of cases did not occur in males. The median age for all cases was 66 years with a range from 36 to 83 years.

Eleven cases were classified as confirmed and one case as probable. The organism involved in the 11 confirmed cases, which was detected by urinary antigen test, was *Legionella pneumophila* serogroup 1. The diagnosis in one of the 11 cases also included the use of the laboratory method nucleic acid amplification (PCR). Further sequence analysis of the clinical isolate determined it to be sequence type 42. As none of the cases had the specimen cultured, monoclonal subtyping was not available. Nucleic acid amplification was the diagnostic method used for the probable case.

Six cases were travel-associated. Countries of travel included Dominican Republic (1), Ireland (2), South Africa (1), United Arab Emirates (1) and United States (1). Two cases were linked to travel related clusters. The remaining six cases were assumed to be community acquired.

No seasonality was evident in the cases in 2015, as described in Figure 1.

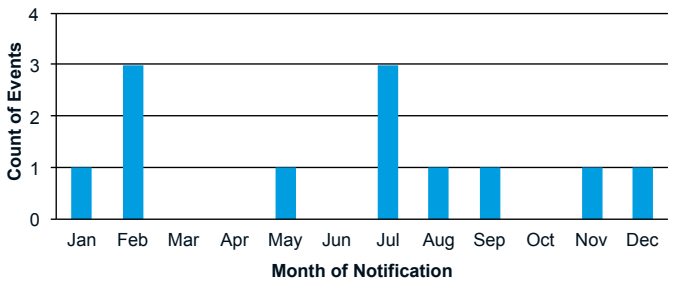

Figure 1. Number of Legionnaires' disease cases by month of notification in Ireland, 2015

Figures for the year 2015 presented in this report were extracted from the computerised infectious disease reporting (CIDR) system on the 4th May, 2016.

Table 1. Number of Legionnaires' disease cases per million population in Ireland, 2008-2015

Age group (years)	2008	2009	2010	2011	2012	2013	2014	2015
<30	0	0	1	0	0	0	0	0
30-39	0	0	0	0	1	1	1	1
40-49	2	0	2	0	1	3	1	1
50-59	3	2	1	1	1	4	2	3
60-69	4	3	3	4	6	1	3	1
70+	2	2	4	2	6	5	1	6
Total	**11**	**7**	**11**	**7**	**15**	**14**	**8**	**12**
CIR	**2.6**	**1.5**	**2.4**	**1.5**	**3.3**	**3.1**	**1.7**	**2.6**

For details of denominator data used, please see Explanatory Notes section at the end of the HPSC annual epidemiological report

2.3 Invasive Group A Streptococcal Disease

Summary

Total number of cases, 2015 = 107

Crude incidence rate, 2015 = 2.3 per 100,000 population

Notifications

In 2015, 107 cases of invasive group A streptococcal (iGAS) disease were notified, which was the lowest figure in four years. This corresponds with a rate of 2.33 iGAS cases per 100,000 population [95% confidence interval (CI): 1.91-2.82], lower than that seen in 2014 (3.57 [95% CI: 3.13 – 4.26]). This decrease is statistically significant.

Case classification

The majority were classified as confirmed cases (n=105; 98%): patients with group A streptococcus (GAS; *Streptococcus pyogenes*) isolated from a sterile site. Two were classified as probable iGAS cases: patients with streptococcal toxic shock syndrome (STSS) or necrotising fasciitis and GAS isolated from a non-sterile site (e.g. throat, sputum, leg wound).

Patient demographics

Of the 107 cases, 60 (56%) were male. The mean age was 43 years (range = 5 months – 99 years) and iGAS was more common in young children and older adults (Figure 1).

Geographic spread and seasonal variation

Table 1 displays the numbers and crude incidence rates (CIRs) of iGAS disease by HSE area from 2011 to 2015. While HSE East accounted for the highest number of reported cases in 2015 (n=40), HSE West had the highest CIR (3.82 per 100,000 population). In two HSE areas, Midlands and Northwest, both the numbers of cases and CIRs increased, while in the other six HSE areas, decreases were reported.

The peak month in 2015 was July (15 cases), followed by April, June and December (12 cases each). Contrary to previous years, there were more cases reported in the second half (July – December: 61 cases) than the first half of the year (January – June: 46 cases) (Figure 2). Figure 3 displays cumulative monthly iGAS cases from 2011 to 2015 inclusive. An increase in notifications which occurred from April 2012 was sustained throughout 2013 and into 2014, with a stabilisation in the latter months of 2014. The opposite can be said of 2015, where the number of cases was much lower than normal in the earlier months, increasing towards the end of the year. Data presented are based on the date the case was notified to Public Health, not on the date the case was first detected.

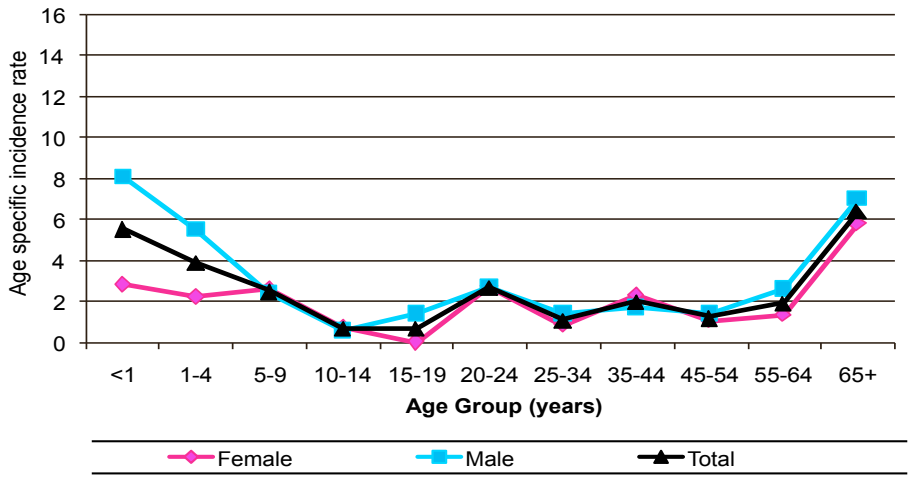

Figure 1. Age and sex specific rates of iGAS disease in 2015

Isolate details

Of 105 confirmed cases, GAS was isolated from a sterile site in 79, with source site not reported for 26. Of reported sterile sites, GAS was isolated primarily from blood cultures (n=57; 72%), deep tissue (n=9; 11%), joints (n=5; 6%), abscesses (n=4; 5%), pleural fluid (n=1; 1%), bone (n=1; 1%), drain fluid (n=1; 1%) and cerebrospinal fluid (CSF) (n=1; 1%). For two cases, GAS was isolated from another sterile site in addition to blood: tissue (n=1) and joint (n=1).

Of the two probable cases, GAS was isolated from non-sterile sites (superficial wound swabs). There were no possible cases of iGAS notified.

Typing data, based on sequencing of the *emm* genes that encode the M protein (the major virulence factor), were available on 92 isolates submitted from 27 laboratories: *emm*-types 1 (n=27; 29%), 12 (n=14; 15%), 28 (n=12; 13%), 89 (n=8; 9%), 3 and 4 (n=4; 4% each) comprised 74% of all the isolates typed. Fifteen other *emm*-types (each represented by ≤3 isolates) were also detected. Of the 10 patients with STSS for whom *emm*-typing was undertaken, four GAS isolates belonged to *emm*1 (40%) and three to *emm*12 (30%).

Enhanced surveillance data

Enhanced data were provided for 96 (90%) of 107 iGAS cases. The source laboratory could be ascertained for all cases. As in previous years, there was wide variation in completeness of enhanced data reporting. Table 2 summarises characteristics of iGAS cases in Ireland from 2011 to 2015.

Clinical details

Clinical presentation data were provided for 89 cases (83%). As in previous years, bacteraemia (n=64 cases, including cases where bacteraemia was not specifically stated but GAS was isolated from blood) and cellulitis (n=34) were the commonest presentations, followed by septic arthritis (n=13), pneumonia (n=12), STSS (n=11; two of which were implied based on the information provided on the clinical presentation), puerperal sepsis (n=6), necrotising fasciitis (n=5), meningitis (n=4), peritonitis (n=3), myositis (n=2) and erysipelas (n=1). Note that an iGAS case could have more than one clinical manifestation of infection.

Risk factors

Risk factor data were provided for 77 iGAS cases (72%). Risk factors included: presence of skin or wound lesions (n=32), diabetes mellitus (n=7), malignancy (n=6), steroid use (n=6),

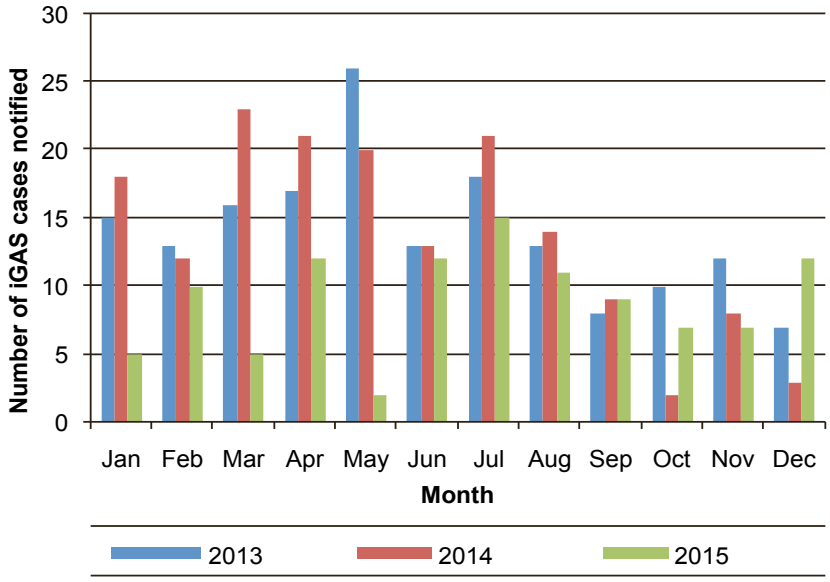

Figure 2. Monthly distribution of iGAS cases, 2013-2015

Table 1. Numbers (n) and Crude Incidence Rates (CIRs) per 100,000 population of iGAS disease by HSE Area (2011-2015)

HSE Area	2011		2012		2013		2014		2015	
	n	CIR	n	CIR	n	CIR	n	CIR	n	CIR
HSE E	29	1.79	51	3.15	67	4.14	65	4.01	40	2.47
HSE M	5	1.77	7	2.48	7	2.48	4	1.42	7	2.48
HSE MW	6	1.58	8	2.11	16	4.22	13	3.43	6	1.58
HSE NE	1	0.23	11	2.50	14	3.18	12	2.72	10	2.27
HSE NW	2	0.77	5	1.94	6	2.32	3	1.16	7	2.71
HSE SE	7	1.41	16	3.22	21	4.22	18	3.62	9	1.81
HSE S	12	1.81	14	2.11	18	2.71	27	4.06	11	1.66
HSE W	5	1.12	10	2.25	19	4.27	22	4.94	17	3.82
IRELAND	67	1.46	122	2.66	168	3.66	164	3.57	107	2.33

CIRs calculated using the 2011 census

recent childbirth (n=5), varicella infection (n=3), alcoholism (n=3), injecting drug use (IDU) (n=3) and non-steroidal anti-inflammatory drug (NSAID) use (n=1). Note that an iGAS case could have more than one risk factor. No risk factors were identified for 24 cases.

Clinical management/severity
Surgical intervention was required for 26 patients (age range = 2 months – 85 years). This included four patients with STSS and three patients with necrotising fasciitis.

Among patients requiring surgical intervention, risk factor data were provided for 20 cases. Risk factors included: skin and wound lesions (n=12), age ≥65 years (n=3), malignancy (n=1), IDU (n=1) and NSAID use (n=1). Note that an iGAS case requiring surgery could have more than one risk factor. No risk factors were identified for six patients.

Twenty-five patients (aged 12 months – 84 years) required intensive care unit (ICU) admission. This included nine patients with STSS and three patients with necrotising fasciitis.

Among patients admitted to an ICU, risk factor data were provided for 22. Risk factors included: age ≥65 years (n=9), skin and wound lesions (n=9), diabetes mellitus (n=3), alcoholism (n=2), IDU (n=1) and varicella infection (n=1). Note that an iGAS case requiring ICU admission could have more than one risk factor. No risk factors were identified for seven patients. Length of ICU stay was provided for 12 cases. The median length of ICU stay was three days (range = 1 – 18).

Other epidemiological information
Seven cases of iGAS were reported as hospital-acquired in 2015.

There was one iGAS outbreak reported in 2015. This was a family outbreak in HSE-E, with three people reported ill. However, just one of the three cases was a confirmed invasive infection. There were also two outbreaks of scarlet fever reported in 2015; one in a crèche with four reported ill and the other in a school with two reported ill.

Outcome
Outcome at seven days following GAS detection was reported for 73 cases:

- 66 were still alive
- Six patients had died, where GAS was the main or contributory cause of death

The seven-day case fatality rate (CFR) for iGAS disease was 9.5%.

Of 11 STSS cases, outcome at seven days was reported for seven. Of those, there was one death due to GAS (CFR = 14%).

Of 26 cases requiring surgical intervention, outcome at seven days was reported for 19. Of those, there were no deaths due to GAS.

Of 25 cases admitted to ICU, outcome at seven days was reported for 17. Of those, there was one death due to GAS (CFR = 6%).

Antimicrobial susceptibility
Antimicrobial susceptibility data were reported on 79 GAS isolates (63 from blood and 16 from other specimens) by 23 laboratories via the European Antimicrobial Resistance Surveillance Network (EARS-Net). All isolates tested were susceptible to penicillin (n=75) and vancomycin (n=56). Resistance to erythromycin was reported in five (7%) of 70

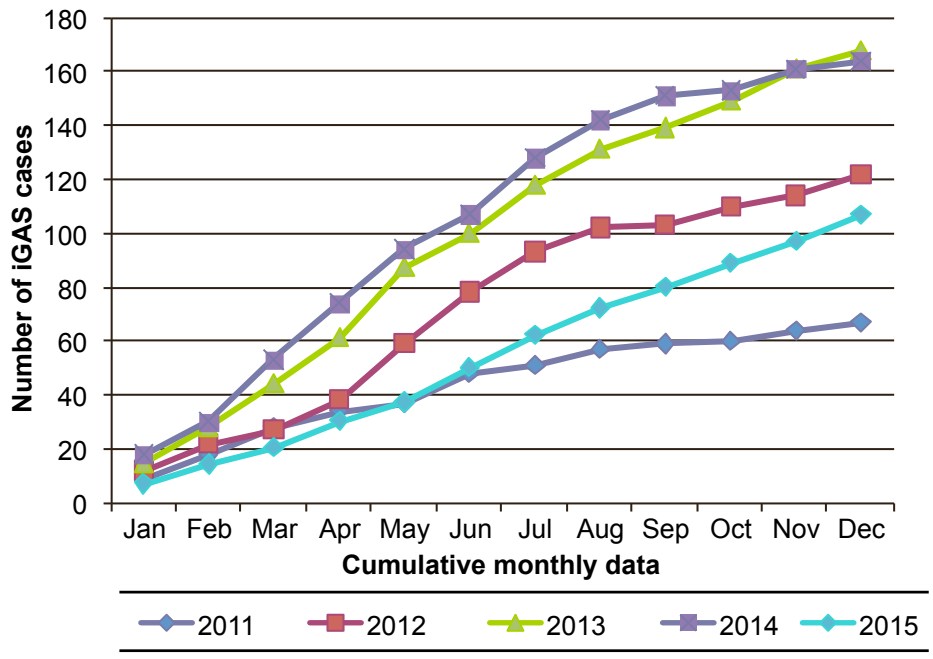

Figure 3. Cumulative monthly numbers of iGAS cases, 2011-2015

Table 2. Characteristics of iGAS cases in Ireland, 2011-2015

	2011	2012	2013	2014	2015
Notifications					
Total iGAS cases notified	67	122	168	164	107
iGAS incidence rate per 100,000 population	1.46	2.66	3.66	3.57	2.30
Cases for which Enhanced data provided** (%)	60 (90%)	106 (87%)	156 (93%)	150 (91%)	96 (90%)
Patient Demographics					
Male (%)	28 (42%)	59 (48%)	95 (57%)	94 (57%)	60 (56%)
M:F ratio	0.72:1	0.94:1	1.30:1	1.34:1	1.19:1
Mean age	43	44	41	44	43
Median age	39	42	40	44	42
Age range	0-97	0-92	0-93	0-99	0-99
Paediatric cases (aged <18 years) (%)	15 (22%)	28 (23%)	45 (27%)	47 (29%)	26 (24%)
Older cases (aged 65+ years) (%)	22 (33%)	42 (34%)	50 (30%)	56 (34%)	34 (31%)
Clinical Presentation†					
Data on Clinical Presentation (%)	58 (87%)	103 (84%)	142 (85%)	132 (80%)	89 (83%)
Streptococcal Toxic Shock-like Syndrome (STSS) without NF (%)	4 (7%)	22 (21%)	28 (20%)	18 (14%)	11(12%)
Necrotising fasciitis (NF) without STSS (%)	1 (2%)	2 (2%)	6 (4%)	4 (3%)	5 (6%)
STSS and NF (%)	2 (3%)	4 (4%)	4 (3%)	3 (2%)	0 (0%)
Bacteraemia with focal presentations (%)	30 (52%)	42 (41%)	45 (32%)	43 (33%)	34 (38%)
Bacteraemia with no focal presentations (%)	15 (26%)	21 (20%)	36 (25%)	34 (26%)	22 (25%)
Other focal presentations with no bacteraemia (%)	6 (10%)	11 (11%)	23 (16%)	30 (23%)	17 (19%)
Bacteraemia (%)	52 (90%)	80 (78%)	107 (75%)	95 (72%)	64 (72%)
Other focal presentations:					
Cellulitis (%)	24 (41%)	41 (40%)	45 (32%)	58 (44%)	34 (38%)
STSS (%)	6 (10%)	26 (25%)	32 (23%)	21 (16%)	11 (12%)
Pneumonia (%)	8 (14%)	17 (17%)	24 (17%)	14 (11%)	12 (13%)
Septic arthritis (%)	2 (3%)	7 (7%)	10 (7%)	11 (8%)	13 (15%)
Necrotising fasciitis (%)	3 (5%)	6 (6%)	10 (7%)	7 (5%)	5 (6%)
Myositis (%)	0 (0%)	4 (4%)	3 (2%)	6 (5%)	2 (2%)
Puerperal sepsis (%)	5 (9%)	6 (6%)	6 (4%)	4 (3%)	6 (7%)
Erysipelas (%)	0 (0%)	3 (3%)	3 (2%)	2 (2%)	1 (1%)
Peritonitis (%)	3 (5%)	1 (1%)	4 (3%)	1 (1%)	3 (3%)
Meninigtis (%)	1 (2%)	3 (3%)	3 (2%)	0 (0%)	4 (4%)
Risk Factors†					
Data on Risk Factors (%)	49 (73%)	96 (79%)	138 (82%)	126 (77%)	77 (72%)
Skin lesions/wounds (%)	20 (41%)	34 (35%)	56 (41%)	50 (40%)	32 (42%)
Diabetes (%)	7 (14%)	5 (5%)	16 (12%)	11 (9%)	7 (9%)
Malignancy (%)	6 (12%)	10 (10%)	23 (17%)	10 (8%)	6 (8%)
Varicella (%)	2 (4%)	9 (9%)	5 (4%)	7 (6%)	3 (4%)
Steroid use (%)	1 (2%)	8 (8%)	11 (8%)	6 (5%)	6 (8%)
Alcoholism (%)	1 (2%)	5 (5%)	6 (4%)	5 (4%)	3 (4%)
Injecting drug user (%)	3 (6%)	6 (6%)	5 (4%)	5 (4%)	3 (4%)
Childbirth (%)	5 (10%)	6 (6%)	6 (4%)	4 (3%)	5 (6%)
Non-steroid anti-inflammatory drug use (%)	1 (2%)	2 (2%)	4 (3%)	2 (2%)	1 (1%)
No identified risk factor (%)	12 (24%)	24 (25%)	47 (34%)	47 (37%)	24 (31%)
Outcome at 7 days					
Data on outcome at 7 days (%)	43 (64%)	65 (53%)	108 (64%)	102 (62%)	73 (68%)
RIP/GAS main cause or contributory (%)	5 (12%)	8 (12%)	16 (15%)	10 (10%)	6 (8%)
STSS cases: Data on outcome at 7 days (%)	5 (83%)	17 (65%)	26 (81%)	17 (81%)	7 (64%)
STSS cases: RIP/GAS main cause or contributory (%)	1 (20%)	6 (35%)	10 (38%)	6 (35%)	1 (14%)
Severity					
Data on Admission to ITU (%)	57 (85%)	99 (81%)	153 (91%)	144 (88%)	92 (86%)
Admitted to ITU (%)	11 (19%)	40 (40%)	44 (29%)	36 (25%)	25 (27%)
Data on Surgical Intervention (%)	45 (67%)	86 (70%)	136 (81%)	127 (77%)	86 (80%)
Surgical Intervention Required (%)	8 (18%)	26 (30%)	39 (29%)	41 (32%)	26 (30%)
Typing					
iGAS isolates that were typed (%)		109 (89%)	140 (83%)	130 (79%)	92 (86%)
Emm-1 (%)		53 (49%)	41 (29%)	21 (16%)	27 (29%)
Emm-3 (%)		4 (4%)	33 (24%)	47 (36%)	4 (4%)
Emm-12 (%)		11 (10%)	4 (3%)	6 (5%)	14 (15%)
Emm-28 (%)		8 (7%)	8 (6%)	12 (9%)	12 (13%)
Emm-89 (%)		4 (4%)	13 (9%)	8 (6%)	8 (9%)
Other emm-types (%)		29 (27%)	41 (29%)	36 (28%)	27 (29%)

** Degree of completion of enhanced surveillance forms varies from case to case: information may not be available on all variables/categories, thus calculations of percentages take into account only those cases for which data are provided
†Note: A patient may have more than one clinical presentation or risk factor

isolates, to clindamycin in four (6%) of 65 isolates and to tetracycline in six (12%) of 49 isolates.

CONCLUSION

In 2015, 107 cases of iGAS infection were notified in Ireland, a substantial decrease from that of the previous two years (2014; n=164, 2013; n=168). The CIR decreased from 3.57 in 2014 to 2.3 per 100,000 in 2015 and this was statistically significant.

Invasive GAS is a potentially life-threatening disease. In 2015, the CFR was 9.5% for all iGAS infections and even higher for patients presenting with STSS (14%). For the first time since 2012, there has been a drop in the number of patients presenting with STSS: 2012 (n=26), 2013 (n=32), 2014 (n=21) and 2015 (n=11).

Typing of *emm* genes was undertaken on a national basis for the first time in 2012, with the establishment of a GAS typing service by the Epidemiology and Molecular Biology Unit (EMBU) at the Children's University Hospital, Temple St. In 2015, one *emm* type, *emm*1, predominated comprising 29% of all isolates typed. This is similar to the situation in 2012 when *emm*1 was also predominant comprising 49% of all isolates typed; while in 2013 both emm1 and emm3 were the dominant *emm* types and in 2014, emm3 was the predominant *emm* type, comprising 36% of all isolates typed. Certain *emm* types, including *emm*1 and *emm*3, are associated with STSS and STSS in turn is strongly associated with increased mortality. The changes observed in the predominant *emm* types in circulation and in the clinical presentations over the last couple of years highlight the dynamic nature of iGAS infection.

Ongoing surveillance is essential, specifically completion of the enhanced data questionnaire, to gain a greater understanding of iGAS, to enable early detection of clusters/outbreaks, to ensure prompt implementation of infection prevention and control precautions and appropriate management of contacts. Epidemiological typing as provided by the EMBU is another vital element to increase insight into GAS infection in Ireland, as certain *emm* types are associated with greater morbidity and mortality.

Antimicrobial susceptibility data confirm that iGAS remains susceptible to penicillin and that penicillin should continue to be the treatment of choice for iGAS.

HPSC thanks participating microbiology laboratories and public health departments for their ongoing contribution to the iGAS enhanced surveillance scheme.

All microbiology laboratories are encouraged:

- to return enhanced iGAS surveillance forms for every patient with iGAS
- to submit all iGAS isolates to the Epidemiology and Molecular Biology Unit (EMBU), Children's University Hospital, Temple St for *emm*-typing
- to submit antimicrobial susceptibility data on all iGAS cases along with EARS-Net quarterly returns

Further information on iGAS disease in Ireland, including the enhanced surveillance form, factsheets for patients and contacts and national guidelines is available at: http://www.hpsc.ie/A-Z/Other/GroupAStreptococcalDiseaseGAS/

The figures presented in this summary are based on data extracted from the Computerised Infectious Diseases Reporting (CIDR) System on **22nd July 2016.**

2.4 Invasive Group B Streptococcal Infections

Summary

2015 Summary

Number of cases: 69

- Early-onset disease (EOD) = 43
- Late-onset disease (LOD) = 26

EOD rate per 1,000 live births, 2015: 0.65

LOD rate per 1,000 live births, 2015: 0.3

Background

Invasive group B streptococcal (iGBS; *Streptococcus agalactiae*) infections in infants <90 days old or stillborn infants have been notifiable in Ireland via the Computerised Infectious Diseases Reporting (CIDR) system since January 2012.

In neonates two syndromes exist:

- Early-onset disease (EOD; age at onset/diagnosis <7 days old)
- Late-onset disease (LOD; age at onset/diagnosis 7-89 days old)

Both include sepsis, pneumonia and meningitis. Stillbirth associated with isolation/detection of *Streptococcus agalactiae* from the placenta or amniotic fluid is also notifiable.

Notifications

In 2015, there were 69 iGBS cases: EOD = 43; rate = 0.69 per 1,000 live births and LOD = 26; rate = 0.39 (Figure 1 and Table 1). (65,909 live births, CSO 2015 data obtained from http://www.cso.ie/en/releasesandpublications/ep/p-vsys/vitalstatisticsyearlysummary2015/)

Three cases presented with meningitis and two cases were associated with stillbirth.

The figures presented in this summary are based on data extracted from CIDR on 28th July 2016.

Table 1. Breakdown and rates of iGBS cases, by disease syndrome: 2013 – 2015.

Disease syndrome	Year					
	2013		2014		2015	
	n (%)	Rate*	n (%)	Rate*	n (%)	Rate*
EOD	42 (64%)	0.61	46 (68%)	0.68	43 (62%)	0.65
LOD	24 (36%)	0.35	22 (32%)	0.33	26 (38%)	0.39
Total	66	0.96	68	1.01	69	1.04

* Incidence rate per 1,000 live births

Live births in the Republic of Ireland (source: www.cso.ie): 2013, 68,930; 2014, 67,462; 2015, 65,909

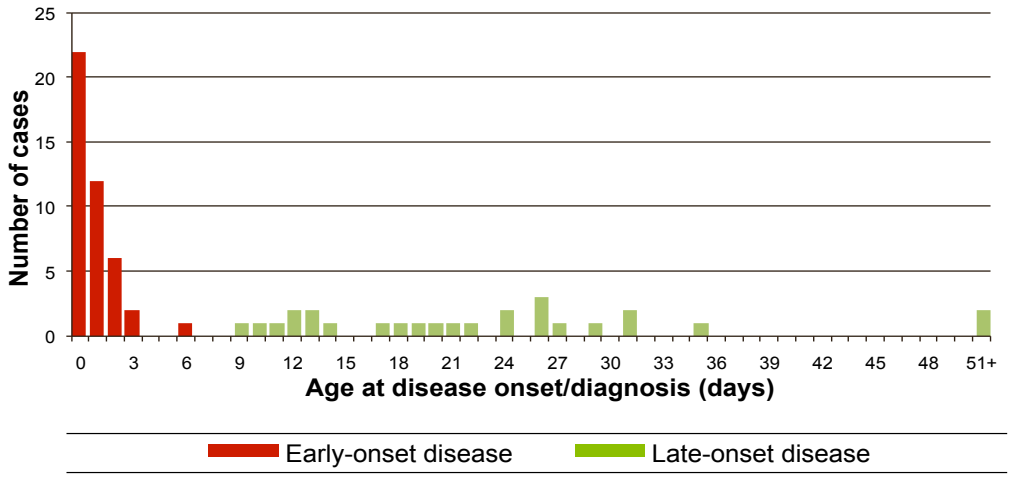

Figure 1. Invasive Group B streptococcal infection by age (in days) at time of onset/diagnosis 2015: EOD <7 days and LOD 7 – 89 days).

2.5 Tuberculosis 2015

Summary

Number of cases in 2015: 303
Crude incidence rate in 2015: 6.6/ 100,000 population
Number of cases in 2014: 313
Treatment outcome known in 2014: 247 (78.9%)
Treatment outcome successful in 2014: 208 (66.5%)

In 2015, 303 cases of tuberculosis (TB) were notified in Ireland, corresponding to a crude incidence rate (CIR) of 6.6 per 100,000 population*, remaining stable in comparison to the CIR of 6.8 reported for 2014 (n=313). A summary of the epidemiology of TB in Ireland during 2015 is shown in table 1 while the number of cases and crude incidence rates from 1991 to 2015 with three-year moving averages are shown in figure 1.

The highest crude incidence rate was reported by HSE-S (10.4/100.000) while the lowest rate was reported by HSE-SE (3.0/100,000).

Cases ranged in age from two to 90 years, with a median age of 40 years. The highest age-specific rate (ASIR) in 2015 occurred among those aged 65 years and older (11.8) followed by those aged 25-34 years (10.2). The rate among males (8.0) was higher than that among females (5.2). Rates among males were higher than females for all age groups. The highest ASIRs among both males (14.0) and females (9.9) were observed in those aged 65 years and older. The male to female ratio (1.5:1) reported in 2015 was consistent with that reported in previous years.

Geographic origin

During 2015, 42.6% (129 cases) of TB cases were born outside Ireland, a slight decrease from the proportion reported in 2014 (43.5%). The crude rate in the foreign-born population decreased from 17.7 per 100,000 population in 2014 to 16.8 per 100,000 population in 2015. The crude rate in the indigenous population was 4.0 per 100,000 population in 2015, which decreased compared to 4.7 per 100,000 population reported in 2014. There was a notable difference in age between those born in Ireland and those born outside Ireland, with a median age of 56 years and 33 years respectively.

Site of infection

Pulmonary TB was reported in 197 (65.0%) cases and 100 (33.0%) had exclusively extrapulmonary disease. Six cases did

Table 1: Summary of the epidemiology of TB in Ireland, 2015

Parameter	Number	% of total cases	CIR / 100,000 population
Total number of cases	303		6.6
Cases in indigenous population†	152	*50.2*	*4.0*
Cases in foreign-born persons†	129	*42.6*	*16.8*
Culture positive cases	198	*65.3*	*4.3*
Pulmonary cases	197	*65.0*	*4.3*
Smear positive pulmonary cases	81	*26.7*	*1.8*
MDR-TB cases	1	*0.3*	*0.02*
XDR-TB cases	0	*0.0*	*0.0*
Mono-resistant to isoniazid	6	*2.0*	*0.1*
Deaths attributable to TB	4	*1.3*	*0.1*
TB meningitis cases	2	*0.7*	*0.04*

*All rates reported are calculated per 100,000 population
†Country of birth was unknown for 22 cases

not have the site of infection reported. Of the extrapulmonary cases reported in 2015, there were two cases of TB meningitis corresponding to a rate of 0.04 per 100,000 population (0.4 per million population).

Microbiology

Of the 303 cases reported in 2015, 65.3% (198 cases) were culture confirmed. Species identification showed *M. tuberculosis* in 93.9% (186 cases), M. tuberculosis complex[‡] in 3.0% (6 cases), *M. bovis* in 2.0% (4 cases). Two culture confirmed cases (1.0%) did not specify the species identified. Of the 197 cases with a pulmonary component, 138 (70.1%) were reported as culture confirmed, and 81 (41.1%) were reported as smear positive.

Drug sensitivity

Information on antibiotic sensitivity testing was available for 190 (96.0%) of the 198 culture confirmed cases. Resistance was documented in 13 (6.8%) cases that reported antibiotic sensitivity, one (0.3% of total cases) of which was an MDR-TB case. Mono-resistance to isoniazid was recorded in six cases, to streptomycin in four and to pyrazinamide in one case. One further case reported resistance to both isoniazid and streptomycin.

HIV status

Information on HIV status was reported for 105 (34.7%) of cases in 2015, a decrease compared to 39.0% with HIV status reported in 2014. Of the cases with HIV status reported, eight (7.6%) were HIV positive and 97 (92.4%) were HIV negative.

Outbreaks

The introduction of the amendment to the Infectious Disease Regulations 1981 on January 1st 2004, made outbreaks, unusual clusters or changing patterns of illness statutorily notifiable by medical practitioners and clinical directors of laboratories to the medical officer of health. Standard reporting procedures for surveillance of TB outbreaks were formally agreed in 2007.

During 2015, five outbreaks of TB were reported to HSPC, with 18 reported cases of active TB, 35 persons with latent TB infection (LTBI) and two hospitalisations. Three outbreaks were reported by HSE-S and one outbreak each was reported by HSE-NW and -W. There was one general outbreak, which occurred in a workplace with five cases of active TB and 35 cases of LTBI. There were also four family outbreaks, comprising three to four cases each. Three of the family outbreaks occurred in private houses and one occurred across an extended family. The number of LTBI cases was not reported for any of the family outbreaks.

The number of outbreaks reported during 2015 remained stable compared to 2014. Figure 2 shows a summary of reported TB outbreaks from 2004 to 2015 by year of outbreak, number of active TB cases and number of persons with LTBI. Please note that numbers of LTBI for outbreaks reported during 2015 are provisional and may increase as outbreak investigations continue.

Treatment outcome for 2014 data

In 2014, information on treatment outcome was provided for 78.9% (247) of cases, an increase compared to 74.7% in 2013. Treatment outcome was reported as completed for 208 (66.5%) cases, 21 (6.7%) cases died, nine cases transferred out (2.9%), six were still on treatment (1.9%) and three (1.0%) had treatment interrupted. The remaining 66 cases were either lost to follow up or did not have treatment outcome reported.

[‡] Species of mycobacteria not specified when reported

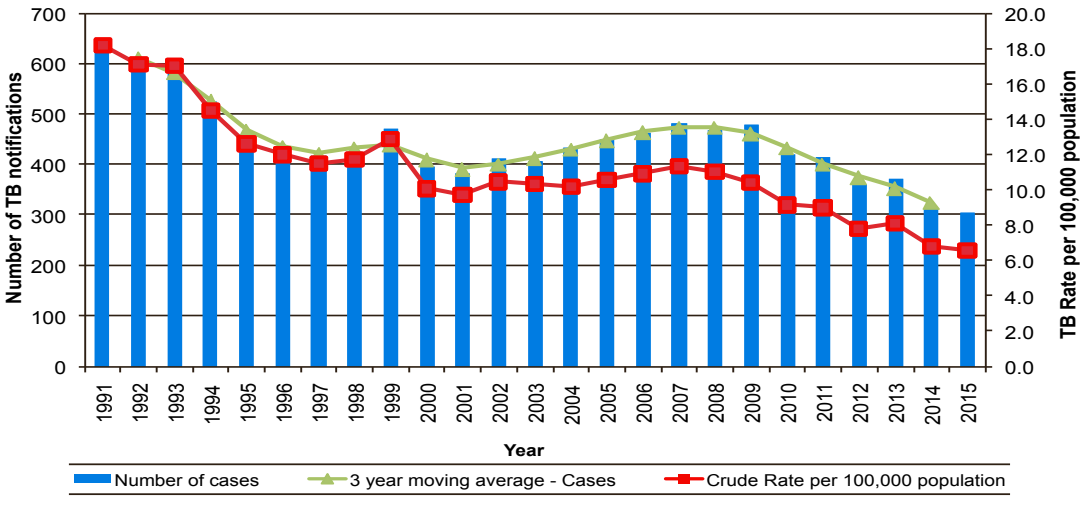

Figure 1: Notified cases of TB in Ireland with crude rates per 100,000 population, 1991 to 2015 and 3-year moving averages, 1992-2014

Four (1.3% of total cases) of the 21 deaths were reported as attributable to TB. During 2014, the reported treatment success rate was 66.9% for new culture confirmed pulmonary TB cases and 71.0% for new smear-positive pulmonary TB cases.

Further details on the epidemiology of TB cases reported in 2015 will be available in the HPSC Report on the Epidemiology of TB in Ireland, 2015 (www.hpsc.ie).

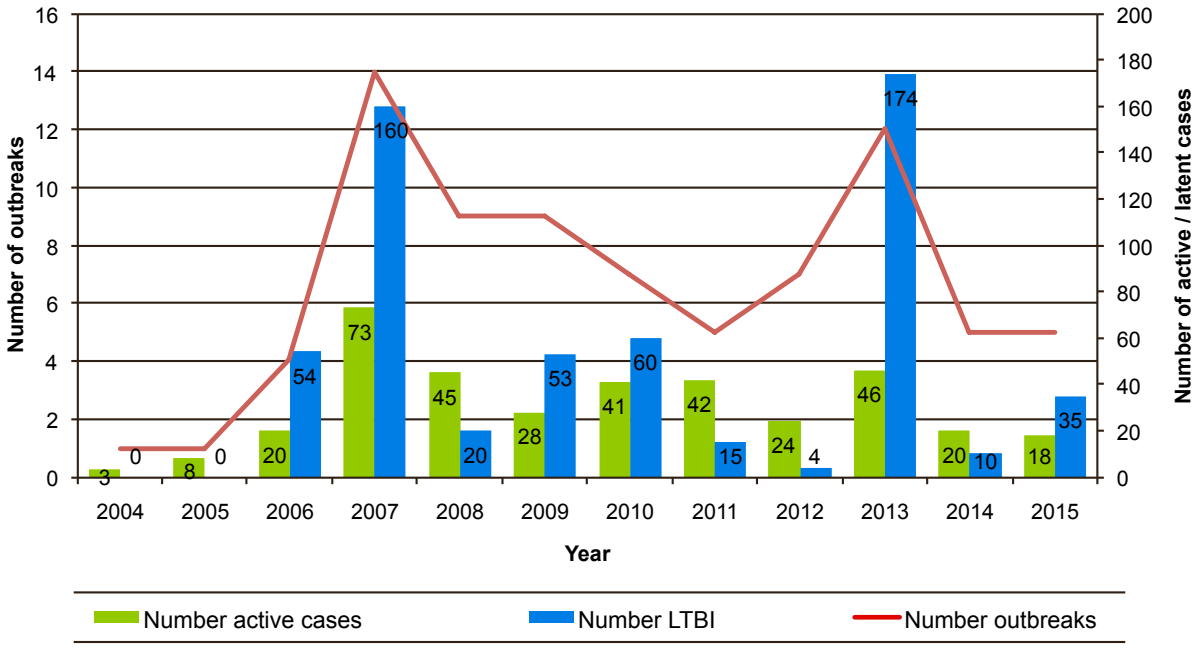

Figure 2: TB outbreak summary by year, 2004-2015

2.6 Chickenpox-hospitalised cases

Summary

Number of cases, 2015: 69
Crude incidence rate, 2015: 1.5/100,000

Chickenpox-hospitalised cases
The Health Act, 1947 entitles the Minister for Health to declare by regulation diseases that are infectious, covered by legislation and that require notification to a Medical Officer of Health. The infectious diseases notifiable in Ireland are regulated in the 1981 Infectious Diseases Regulations. The amendment S.I. No. 452 of 2011 to these regulations specified for the first time the disease chickenpox, hospitalised cases only, as notifiable. Chickenpox is caused by varicella-zoster virus. The case definition is available at www.hpsc.ie.

In 2015, 69 (1.5/100,000) hospitalised chickenpox cases were notified in Ireland compared to 61 (1.3/100,000) in 2014. In 2015, the largest number of cases was in the HSE E (table 1). Of the 69 cases, 44 (64%) were classified as confirmed and 25 (36%) as possible. The highest age specific incidence rates were in those aged less than ten years (figure 1). Of the 69 cases, 38 (55%) were male and 29 (42%) were female while sex was unreported for two cases (3%).

Chickenpox/varicella outbreaks
The amendment S.I. No. 707 of 2003 to the infectious disease regulations specified that unusual clusters or changing patterns of illness that may be of public health concern must be reported. Therefore, outbreaks of chickenpox must be notified regardless of hospitalisation status. One outbreak of possible chickenpox was notified in 2015. This outbreak occurred in a private house with two ill; both cases were reported as being hospitalised.

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 1st September 2016. These figures may differ slightly from those published previously due to ongoing updating of notification data on CIDR.

Table 1. Number of notified hospitalised chickenpox cases and the crude incidence rate per 100,000 population (CIR) by HSE Area in 2015

HSE Area	Number	CIR
HSE E	32	2.0
HSE M	7	2.5
HSE MW	2	0.5
HSE NE	7	1.6
HSE NW	3	1.2
HSE SE	8	1.6
HSE S	6	0.9
HSE W	4	0.9
Total	**69**	**1.5**

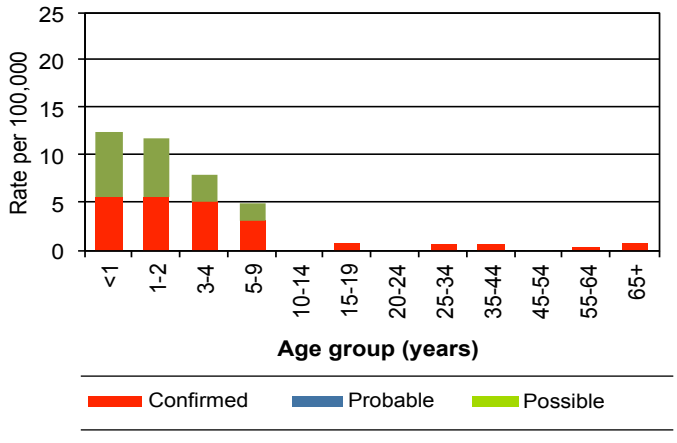

Figure 1. The age specific incidence rate (per 100,000 population) of notified hospitalised chickenpox cases in 2015 by case classification

2015

ANNUAL EPIDEMIOLOGICAL REPORT

03

INFECTIOUS INTESTINAL DISEASES

3.1 Campylobacter

Summary

Number of campylobacteriosis cases: 2,451
Campylobacteriosis crude incidence rate (CIR): 53.4/100,000

Campylobacteriosis became a notifiable disease in Ireland in 2004 under the Infectious Diseases (Amendment) Regulations. Prior to this, data on laboratory-confirmed cases of *Campylobacter* infection in humans were collected nationally as part of the EU Zoonoses Regulations (while some cases were included in the former category of "Food Poisoning (bacterial other than *Salmonella*)"). It is an acute zoonotic bacterial disease characterised by diarrhoea, abdominal pain, malaise, fever, nausea and vomiting. Symptoms generally last for only a few days. Campylobacteriosis is the commonest bacterial cause of gastroenteritis in Ireland and Europe.[1]

Although levels of campylobacteriosis remained elevated during 2015 for the fifth consecutive year, a decrease of 6.1% was observed in comparison with 2014. During 2015, 2,451 notifications were reported to HPSC, corresponding to a crude incidence rate of 53.4/100,000 population, which is lower than the 2014 European crude incidence rate of 71.0 per 100,000 population.[1]

Historically, variation in campylobacteriosis crude incidence rates (CIRs) has been reported between HSE areas. During 2015, the highest CIRs occurred in HSE-SE (72.6) and HSE-M (72.6). The lowest CIR was reported by HSE-NW (29.8) and -NE (36.3).

Campylobacteriosis occurs in all age groups with the highest rate of notification reported in the 0-4 year age group. This preponderance in younger children is a well described characteristic of the disease and is also observed at European level. A comparison of the mean age-specific incidence rate between 2004-2014 and the age-specific rate in 2015 showed an increase of >40% in those aged 65 years and older. This is the fourth consecutive year that the CIR has been markedly above the mean rate in this age group. Figure 1 compares the campylobacteriosis age specific rates (ASIR) for 2015 with the mean campylobacteriosis ASIR for 2004 to 2014.

Campylobacteriosis has a well-documented seasonal distribution with a peak in summer. In Ireland, notifications typically peak during May to July. During 2015, notifications

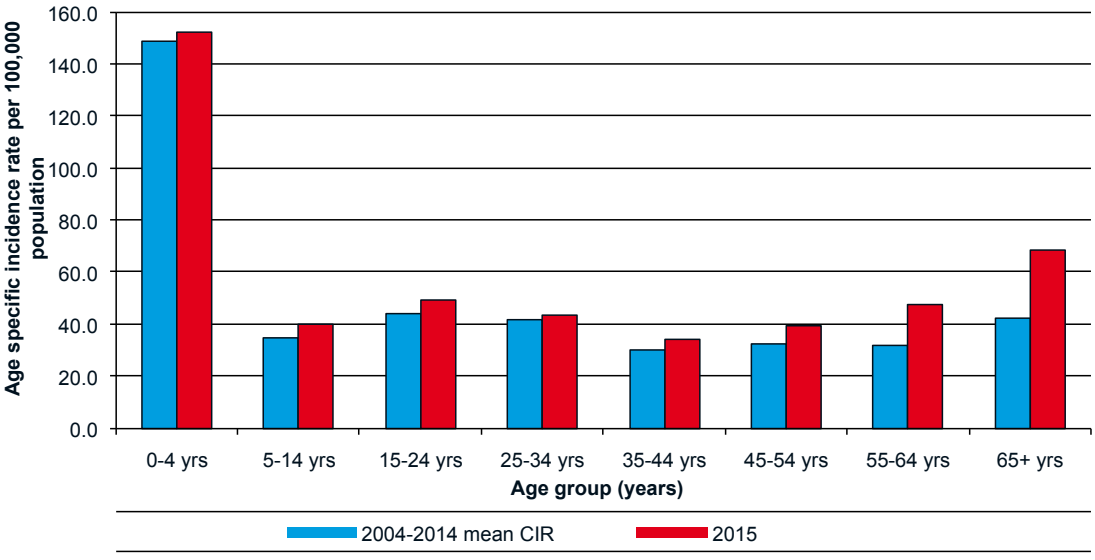

Figure 1: Campylobacteriosis ASIR 2015 compared to 2004-2014 mean ASIR (CIDR)

[1] Rates are calculated per 100,000 population

peaked during May, with two smaller secondary peaks also observed during July and September. Figure 2 compares the monthly number of campylobacteriosis notifications for 2015 to the mean monthly number of campylobacteriosis notifications between 2004 and 2014.

All bar one of the cases notified in Ireland during 2015 were laboratory confirmed. However, as there is currently no national reference facility for routine typing of *Campylobacter* isolates, information on *Campylobacter* species is strikingly incomplete. In 2015, 21.1% (n=518) of isolates were speciated. Of the 518 speciated isolates, 89.8% (n=465) of isolates were *C. jejuni* and 10.2% (n=53) were *C. coli*.

During 2015, there were six outbreaks of campylobacteriosis reported to HPSC as described in Table 1.

References:

1. European Food Safety Authority (EFSA), European Centre for Disease Prevention and Control (ECDC). The Community summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in the European Union in 2014. The EFSA Journal (2015); 11(4):3129 Available at: https://www.efsa.europa.eu/en/efsajournal/pub/4329

Table 1: Campylobacteriosis outbreaks summary, 2015 (CIDR)

Outbreak location	Mode of transmission	Number outbreaks	Number ill	Number hospitalised	Number dead
Private house	P-P - Person-to-person	2	3	0	0
	Unknown	1	2		
Childcare facility	P-P and Animal	1	2	0	
Residential institution	Unknown	1	3	1	0
Workplace	Animal contact	1	5	0	
Total		6	15	1	

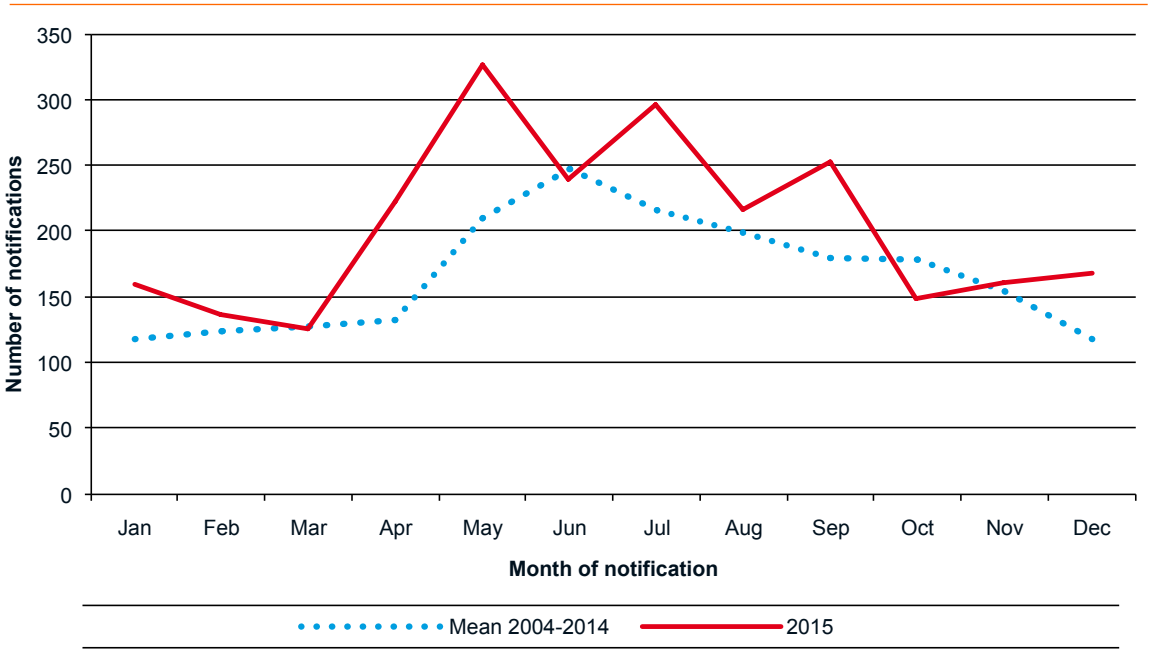

Figure 2: Campylobacteriosis notifications by month during 2015 compared to mean monthly notifications 2004-2014 (CIDR)

3.2 Cryptosporidiosis

Summary

Number of cases, 2015: 439

Number of cases, 2014: 394

Crude incidence rate, 2015: 9.6/100,000

Cryptosporidium is a protozoal parasite that causes a diarrhoeal illness in humans known as cryptosporidiosis. It is transmitted by the faeco-oral route, with both animals and humans serving as potential reservoirs. Human cryptosporidiosis became a notifiable disease in Ireland in 2004, and the case definition in current use is published on the HPSC website.

In 2015, 439 cases of cryptosporidiosis were notified in Ireland, a crude incidence rate (CIR) of 9.6 per 100,000 population (95% CI 8.7-10.5). Of the notified cases 39.4% were hospitalised. There were no reported deaths.

Although, the incidence increased by 11% in 2015 compared with 2014 (8.6/100,000), this was not statistically significant (p=0.06) and was lower than the incidence in 2012 and 2013 (Figure 1). In 2015 the European Centre for Disease Prevention and Control (ECDC) reported an overall notification rate of 3.1 per 100,000 population in the European Union. Among the countries reporting on cryptosporidiosis in 2015, Ireland has the highest rate followed by the United Kingdom (9.1/100,000) and Sweden (5.4/100,000).[1]

Consistent with previous years, the highest age-specific incidence rate (ASIR) was in children under 5 years of age, with 60 cases per 100,000 population in this age group (Figure 2). While there is likely to be a bias towards testing of diarrhoeal stool specimens from children (as opposed to adults) for *Cryptosporidium,* it is also likely that this distribution reflects to some extent a true difference in risk between adults and children. In 2015, the distribution of cases by gender in children under 5 years of age was higher in males (M:F ratio 1.5:1).

Compared with 2014, the incidence rate in 2015 increased in five of the eight HSE areas, remaining stable in the HSE-NE and decreasing in the HSE-NW and HSE-S (Figure 3). As in previous years, there was a strong urban-rural divide, with the HSE-E having the lowest incidence rate (3.0 per 100,000). Although incidence remains low in HSE-E in 2015, compared with 2014, the incidence rate doubled (Figure 3). The HSE-W, HSE-SE and HSE-M reported the highest incidence rates (18.2, 17.9 and 17.4 per 100,000, respectively).

As in previous years, the highest number of cases was notified in spring and peaked in April, followed by a second less intense peak in September (Figure 4).

Risk factors

Reviewing case-based enhanced surveillance data, exposure to farm animals or their faeces either by virtue of residence on a farm or by visiting a farm during the potential incubation period was common among cases; 51% of cases reported one or both of these exposures (Table 1). This is

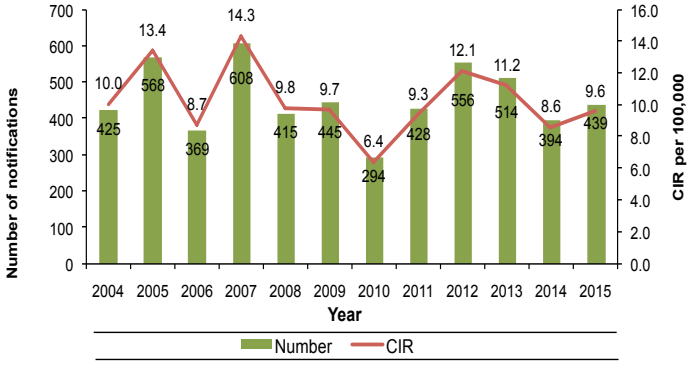

Figure 1. Annual number and crude incidence rate cryptosporidiosis, Ireland, 2004-2015

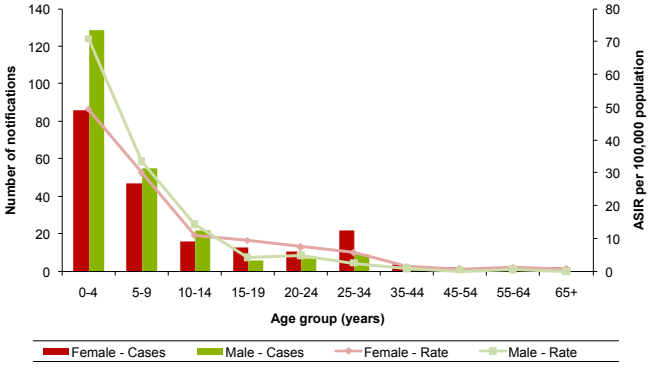

Figure 2. Age-specific incidence rate (ASIR) cryptosporidiosis, Ireland, 2015

consistent with the low incidence of cryptosporidiosis among residents in the largely urban HSE-E population and the higher incidence reported in more rural parts of the country. The proportion of cases reporting exposure to pets and swimming pools was similar to last year (Table 1).

Of note, in 2015 there was a significant increase in the proportion of cryptosporidiosis infections acquired abroad (12.7%) compared with 3.7% in 2014 (p<0.001). The highest proportion of travel-related cases in 2015 occurred in late summer/early autumn, with Spain being the most commonly reported travel-destination (Figure 5).

Table 2 shows the distribution of notified cases by home water supply type. Persons who are not served by public water supplies have an increased risk of cryptosporidiosis; they are over-represented among cases relative to the distribution of households by water supply type nationally. This was particularly noticeable for private well users (25% and 10%, respectively).

However, it should be borne in mind that persons whose household drinking water is not from a public supply are more likely to be rural dwellers and therefore may also have a higher likelihood of exposure to farm animals and rural environments which are also likely to increase their risk.

Outbreaks

In total 18 cryptosporidiosis outbreaks were reported in 2015 (5 general and 13 family outbreaks) and this is identical to the total number reported in 2014 (Figure 6). Overall since 2011 there has been an increase in the number of outbreaks notified. This is most likely due to the increased recognition of small family outbreaks following the introduction of enhanced surveillance for cryptosporidiosis cases late in 2010.

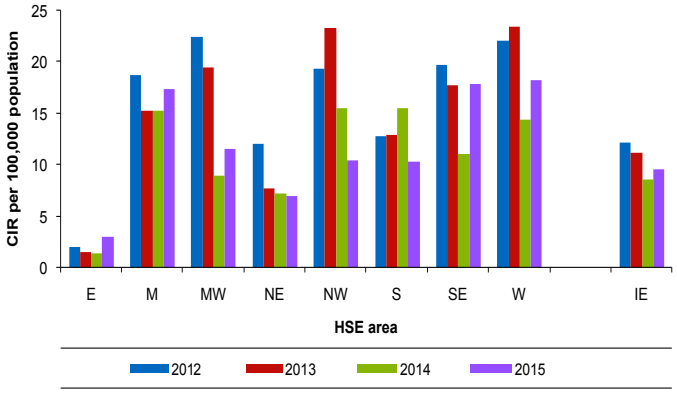

Figure 3. Regional crude incidence rates (CIR) cryptosporidiosis, Ireland, 2012-2015.

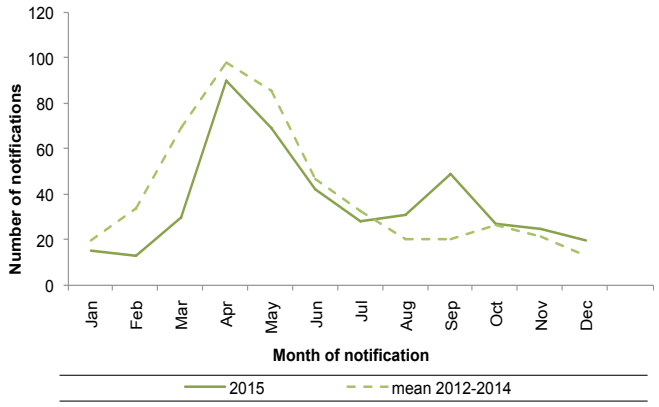

Figure 4. Seasonal distribution of cryptosporidiosis cases, Ireland, 2015 compared to the mean for 2012-2014

Table 1. Number of cases (and percentage of cases where information available) where selected risk factors were reported for cryptosporidiosis cases (n=439), Ireland, 2015

Risk factor	Yes	No	Unknown / Not specified	% of known
Travel outside of Ireland[a]	51	350	38	12.7
Lives/cared for on farm	111	286	42	28.0
Visited farm	109	242	88	31.1
Lives/works on or visited farm[b]	204	196	39	51.0
Swimming pool visit	108	276	55	28.1
Other water based activities	30	274	135	9.9
Contact with domestic pets	273	112	54	70.9

[a]*Based on country of infection variable*
[b]*Composite of the two previous variables*

Table 2. Number of cases and percentage of cases where information is available by home water supply type compared to the number and percentage of households by water supply type, Ireland 2015

Home water supply of notified cases	Number of cases	% of known cases	No. households served by these water supply types in the general population 2011 (Census 2011)	% of known households	P value*
Group water scheme (private)	22	5.5%	45,774	2.9%	
Group water scheme (public)	36	8.9%	144,428	9.0%	
Other	2	0.5%	2,080	0.1%	<0.001
Private well	101	25.1%	161,532	10.1%	
Public water supply	242	60.0%	1,247,185	77.9%	
Unknown/not specified	36		48,409		
Total	**439**		1,649,408	100%	

*Comparing the proportion of cases and households served by public water supplies versus all other supply types: X^2=52.1, P<0.001

Among the five general outbreaks reported, one was associated with a childcare setting, one with drinking water, one with a swimming pool and one with an agricultural college (Table 3 and Figure 7). The general outbreaks were small in size (range: 2-8 cases per outbreak) and four of the cases were hospitalised.

The 13 family outbreaks notified in 2015 occurred in private homes; 33 cases were ill and three were hospitalised. The most common transmission route reported in these outbreaks was person-person spread (seven outbreaks, 20 persons ill and two hospitalised), followed by animal contact (2 outbreaks, 4 persons ill, no one hospitalised) and waterborne (2 outbreaks, 4 persons ill, no one hospitalised).

Table 3. Number of outbreaks and number ill by transmission route and location, Ireland 2015

Outbreak location	Person-to-person		Waterborne		Animal contact		UNK/Not specified		Total	
	No. outbreaks	No. ill	No. outbreaks	No. ill	No. outbreaks	No. ill	No. outbreaks	No. ill	No. outbreaks	No. ill
Private house	5	12	2	4	3	6	2	5	**12**	**27**
Extended family	2	8	0	0	0	0	0	0	**2**	**8**
Community	1	6	1	8	0	0	0	0	**2**	**14**
Swimming pool	0	0	1	4	0	0	0	0	**1**	**4**
College	0	0	0	0	1	2	0	0	**1**	**2**
Total	**8**	**26**	**4**	**16**	**4**	**8**	**2**	**5**	**18**	**55**

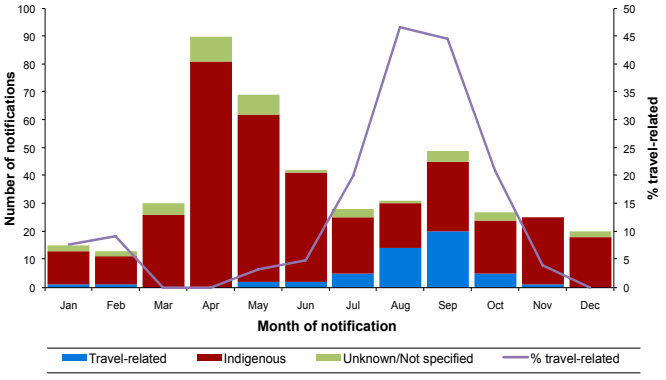

Figure 5. Seasonal distribution of cryptosporidiosis cases based on country of infection, Ireland, 2015

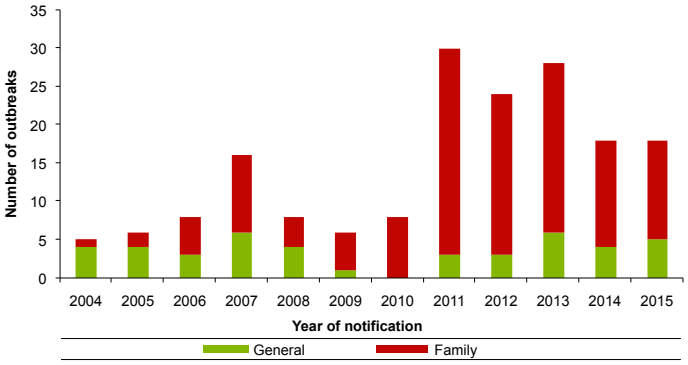

Figure 6. Number of cryptosporidiosis outbreaks notified by type, Ireland 2004-2015

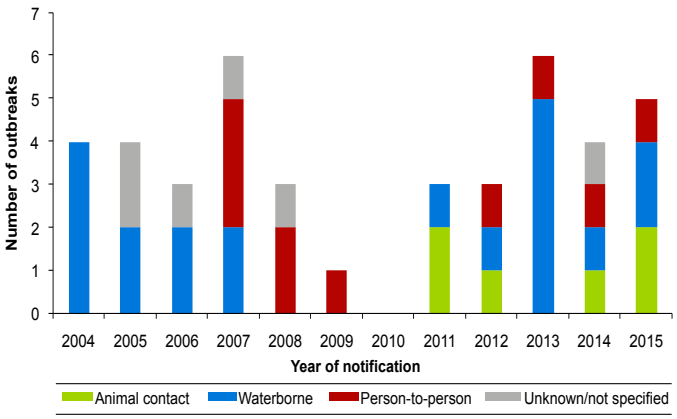

Figure 7. Number of general cryptosporidiosis outbreaks by transmission route and year, Ireland 2004-2015

Note: In this figure, reported transmission routes were grouped for simplicity. Any outbreak where food contributed was reported as foodborne, any outbreak where water contributed was reported as waterborne, any outbreak where animal contact contributed was reported as animal contact. Person-to-person outbreaks include only those outbreaks reported as being due only to person-to-person transmission.

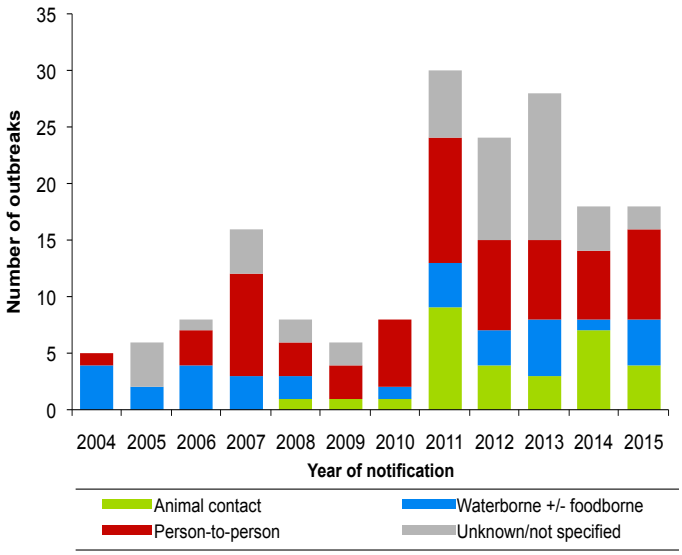

Figure 8. Number of cryptosporidiosis outbreaks by transmission route, Ireland 2004-2015

Note: In this figure, reported transmission routes were grouped for simplicity. Any outbreak where food contributed was reported as foodborne, any outbreak where water contributed was reported as waterborne, any outbreak where animal contact contributed was reported as animal contact. Person-to-person outbreaks include only those outbreaks reported as being due only to person-to-person transmission.

The transmission route was unknown for the remaining two family outbreaks; five persons ill including one hospitalised case (Table 3 and Figure 8).

Summary

In 2015, the incidence of cryptosporidiosis in Ireland increased compared with 2014, but was still lower than the rates reported in 2012 and 2013. The incidence of cryptosporidiosis in Ireland remains high relative to most other EU countries. The seasonal, age and regional distribution in incidence reported in 2015 was also typical of previous years; consistently there has been a higher incidence in springtime, in young children and in non HSE-E areas.

Person-to-person spread appears to be an important mode of transmission within family outbreaks, while both enhanced surveillance data on cases and outbreak surveillance data are consistent with animal contact being an important risk factor for cryptosporidiosis in Ireland, over half the cases reported contact with a farm. Unlike previous years, in 2015 there was an increase in the proportion of travel-associated cases reported with many of these cases occurring in late summer/early autumn.

From the enhanced information on CIDR, exposure to water from non-public supplies appears to present a higher risk of cryptosporidiosis; persons who are not served by public water supplies were over-represented among the sporadic cases relative to the distribution of households by water supply type nationally.

References

1. ECDC. Surveillance Atlas of Infectious Diseases. Available at http://atlas.ecdc.europa.eu/public/index.aspx?Dataset=27&FixDataset=1

3.3 Verotoxigenic *E. coli*

Summary

Number of VTEC cases, 2015: 730
Crude incidence rate, 2015: 15.9/100,000
Number of VTEC-associated HUS, 2015: 22
Number of VTEC cases, 2014: 707

Introduction

For many years, Ireland has the highest verotoxigenic *Escherichia coli* (VTEC) notification rate in Europe, with the exception of 2011 when Germany reported the highest rate due to a large VTEC O104 outbreak linked with fenugreek seeds.[1-2] In 2015, the notification rate for confirmed VTEC cases in the European Union/European Economic Area was 1.52 per 100,000 (similar to 2014; 1.56/100,000) and the highest country-specific rates were in Ireland, Sweden and the Netherlands (12.92, 5.65 and 5.08 per 100,000 population, respectively).[3]

The dominant transmission routes reported for VTEC infection in Ireland have been person-to-person spread, especially in childcare facilities and among families with young children, and waterborne transmission associated with exposure to water from untreated or poorly treated private water sources.[4-8] Other important transmission routes identified internationally include food (often minced beef products or fresh produce such as lettuce and spinach), and contact with infected animals or contaminated environments.[2, 9-10]

Materials and Methods

Infection with verotoxigenic *E. coli* became a notifiable disease in 2012; prior to that VTEC were notifiable under the category Enterohaemorrhagic *E. coli* (EHEC) since 2004. Enhanced epidemiological information was supplied as in previous years by HSE personnel, and the VTEC National Reference Laboratory at the Public Health Laboratory, Cherry Orchard Hospital Dublin (VTEC-NRL at PHL) provided VTEC confirmation and typing data. Data from all sources are maintained in the Computerised Infectious Disease Reporting (CIDR) system. Outbreaks of VTEC are notifiable since 2004 and these data are reported to CIDR by the eight regional Departments of Public Health. The data presented in this report were extracted from CIDR on 23rd November 2016.

Data from the Central Statistics Office (CSO) 2011 census were used to provide denominators for the calculation of national, regional and age-specific incidence rates in 2015.

Results

Incidence

In 2015, 730 cases of VTEC were notified in Ireland, equating to a crude incidence rate (CIR) of 15.9 per 100,000 (95% CI 14.8-17.1). Compared with 2014 there was a 3% increase in the incidence of VTEC (15.4 per 100,000); p=0.54). Of the 730 VTEC notifications in 2015, 600 (82%) were classified as confirmed cases (CIR 13.1 per 100,000; 95% CI 12.0-14.1), 126 as probable cases and four as possible cases. The criteria under which notified cases were reported in 2015 is outlined in Table 1.

As the classification of VTEC cases changed significantly upon the amendment of the Irish VTEC case definition in 2012, it is not valid to directly compare the number of notifications by case classification before 2012.

Table 1. Number of VTEC notifications by criteria for notification, Ireland, 2015

Notification criteria	Confirmed	Probable	Possible	Total
Laboratory confirmation by culture[a]	483	88	-	**571**
Laboratory confirmation by PCR only[b]	117	15	-	**132**
Serodiagnosis (valid for HUS only)	-	-	-	**0**
Reported solely on the basis of epidemiological link	-	23	-	**23**
Clinical HUS not meeting lab or epi criteria	-	-	4	**4**
Total	**600**	**126**	**4**	**730**

[a] Symptomatic culture confirmed cases are classified as confirmed cases, while asymptomatic culture confirmed cases are classified as probable cases

[b] Symptomatic PCR-confirmed cases are classified as confirmed cases, while asymptomatic PCR-confirmed cases are classified as probable cases

Of the 703 cases with laboratory evidence of infection, 241 cases (34%) were reported as being infected with *E. coli* O26 (5.3 per 100,000; 95% CI 4.6-5.9), 150 cases (21%) with *E. coli* O157 (3.3 per 100,000; 95% CI 2.7-3.8), 308 cases (44%) with other VTEC strains, and 4 cases had mixed VTEC infections and were infected with more than one VTEC strain. Of the 23 probable cases reported on the basis of an epidemiological link to a confirmed case, one was linked to an *E. coli* O157 case, one was linked to an *E. coli* O26 case and 21 were linked to an outbreak due to mixed VTEC infection. Figure 1 illustrates the distribution of VTEC cases in Ireland by serogroup since 1999. The downward trend in VTEC infections due to *E. coli* O157 and the upward trend in *E. coli* O26 observed in recent years continued in 2015. Compared with 2014, there was a 16% decrease in O157 infections, a 3% increase O26 infections and a 7% increase in other non-O157/non-O26 infections.

Severity of illness

Of the 730 notified cases in 2015, 622 (85%) were symptomatic and 197 (32%) of the symptomatic cases developed bloody diarrhoea (36% of symptomatic cases when limited to where the bloody diarrhoea variable is completed). Twenty-two individuals (3%) developed HUS, a decrease of 19% on 2014 (n=27) and of 29% on 2013 (n=31). In 2015, five deaths occurred among VTEC cases, however only one of these five deaths was attributed to VTEC infection. Where hospitalisation status was reported (n=714), 237 (33%) of these cases were hospitalised (36% of symptomatic cases).

Of the 22 HUS cases, seven were infected with *E. coli* O26, four with *E. coli* O157, two ungroupable and one each with *E. coli* O103, O145 and O177 (Table 2). Of the remaining six HUS cases, two were reported as confirmed cases (verotoxin genes detected in stool samples but no isolate was cultured) and four were possible cases (i.e. clinical HUS, without laboratory or epidemiological criteria). Although, numbers are small, 27% (i.e. 3 of 8) *E. coli* O26 vertotoxin 2 (*vt2*) developed HUS.

HUS cases ranged in age from 6 months to 74 years and 73% (n=16) of the cases were in children under 10 years of age. Fifteen of the HUS cases were considered sporadic,

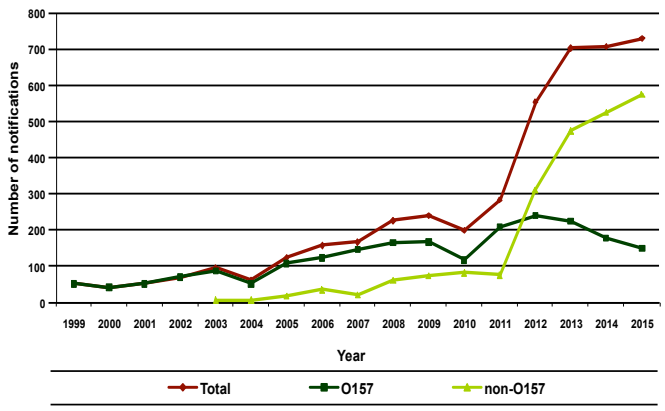

Figure 1. Annual number of confirmed and probable VTEC cases by serogroup, Ireland 1999-2015

Note: For simplicity in this figure, cases with mixed VTEC O157/other serogroup infections are included in the data for O157, as are probable cases linked to known *E. coli* O157 outbreaks. Non-O157 data includes cases with mixed non-O157 infections and probable cases linked to known O26 outbreaks

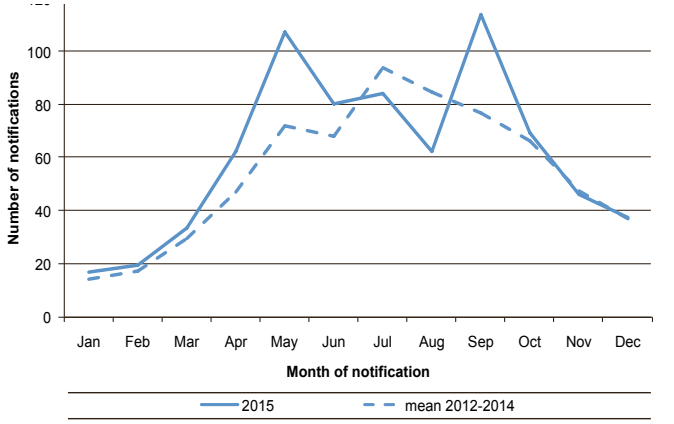

Figure 2. Seasonal distribution of the number of VTEC notifications in Ireland, 2015 and the mean of 2012-2014

Table 2. Number of VTEC notifications by serogroup, verotoxin and HUS status, Ireland, 2015

Serogroup[a]	Verotoxin	HUS	non-HUS	Total	% with HUS
O26	*vt1*	0	77	**77**	0.0%
	vt2	3	8	**11**	27%
	vt1+vt2	4	150	**154**	2.6%
	Not reported	0	1	**1**	0.0%
O157	*vt1*	0	0	**0**	0.0%
	vt2	4	115	**119**	3.4%
	vt1+vt2	0	32	**32**	0.0%
	Not reported	0	1	**1**	0.0%
Other	*vt1*	0	117	**117**	0.0%
	vt2	6	125	**131**	4.6%
	vt1+vt2	1	57	**58**	1.6%
	Not reported	0	3	**3**	0.0%
No organism	Unknown	4	22	**26**	15.4%
Total		**22**	**708**	**730**	3.0%

[a]For simplicity mixed infections were recorded as O157 if at least one strain was O157, as O26 if at least one strain was O26 but not O157, and as Other if only non-O157 or non-O26 strains were detected.

four were part of family outbreaks and three were part of general outbreaks (including two cases linked to the same community outbreak).

Seasonal distribution

Figure 2 shows the seasonal distribution of notifications in 2015 relative to the mean monthly number of cases in the years 2012-2014. The typical summer peak normally seen in July was not observed in 2015; two distinct peaks were seen of almost similar magnitude, one in April and the other in September. However, examining the seasonal distribution by serogroup variations were observed; O26 and non-O157/non-O26 (others) had a bimodal distribution (Figure 3). *E. coli* O26 peaked in July and September and non-O157/non-O26 (others) peaked in May and September. Although, the numbers of *E. coli* O157 notifications peaked in September, this peak was not as pronounced as previous years and was preceded with smaller peaks in May and July (Figure 3).

Regional distribution

In 2015, the highest VTEC incidence rates were reported in the HSE-W followed by the HSE-M, HSE-MW and HSE-SE, where the rates were significantly higher than the national crude incidence rate (Table 3). The incidence of VTEC in HSE-E and HSE-NW were significantly lower than the national crude incidence rate. The highest incidence of HUS amongst VTEC cases was in HSE-M and HSE-MW (Table 3). In the eight HSE areas, the incidence of *E. coli* O26 in 2015 exceeded or equaled that of *E. coli* O157 (Figure 3). Other serogroups (i.e. non-O157/non-O26) accounted for the highest rates of VTEC infections in five of the eight HSE areas (Figure 3)

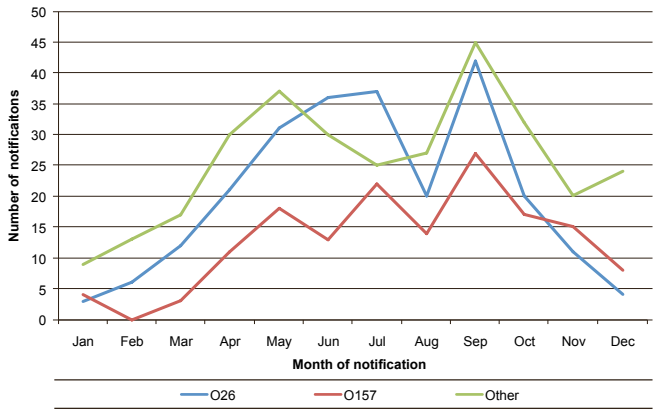

Figure 3: Seasonal distribution of VTEC notifications by serogroup, Ireland, 2015

For simplicity mixed infections were recorded as O157 if at least one strain was O157, as O26 if at least one strain was O26 but not O157, and as Other if only non-O157 or non-O26 strains were detected.

Age-sex distribution

As in previous years, the highest reported age-specific incidence rate in 2015 was in the 0-4 year age group (81.4 per 100,000). Incidence rates were higher among females in all age groups 20 years of age and older but were slightly higher in males in those <15 years of age (Figure 5).

Laboratory typing

In 2015, the serogroup and verotoxin profiles of VTEC isolates/samples referred to the VTEC-NRL at PHL, Cherry Orchard Hospital are presented in Table 4. The most common serogroup reported was *E. coli* O26 (n=241), followed by *E. coli* O26 (n=150). Among the other serogroups listed by the World Health Organisation as having the highest association with HUS internationally, there were 41 *E. coli* O145, 15 *E. coli* O103 cases and 6 *E. coli* O111. Although numbers are relatively small, infections due to O145 continued to increase from 17 cases in 2013, to 31 cases in 2014 and 41 cases in 2015.

As usual among *E. coli* O157 cases in Ireland, isolates containing the genes for *vt2* were more common (78%) than strains containing genes for both *vt1* and *vt2*. Among the VTEC O26 strains those containing the genes for both *vt1* and *vt2* accounted for the majority (64%), followed by *vt1* only (32%) and those containing *vt2* making up the remaining 4% of *E. coli* O26 cases. In contrast, the majority (85%) of O145 strains were *vt2*-postive. Furthermore, *vt1*-containing strains made up the majority of O103 strains (87%), while VTEC O111 comprised of *vt1* (50%) and *vt1+vt2* (50%) containing strains (Table 4).

Risk factors

Under the enhanced surveillance system for VTEC, risk factor information is routinely collected on all notifications (Table 5).

Exposure to farm animals or their faeces and exposure to private well water were relatively common among cases in

Table 3. Number and crude incidence rates of by serogroup and HSE area, and number and crude incidence rate of VTEC-associated HUS by HSE area, Ireland, 2015

HSE-area	Number of VTEC cases	Crude incidence rate /100,000 (95% CI)	Number HUS cases	Incidence of HUS /100,000 (95% CI)
E	84	5.2 (4.1-6.3)	3	0.2 (0.0-0.4)
M	85	30.1 (23.7-36.5)	3	1.1 (0.0-2.3)
MW	109	28.7 (23.3-34.1)	4	1.1 (0.0-2.1)
NE	67	15.2 (11.6-18.8)	1	0.2 (0.0-0.7)
NW	25	1.9 (5.9-13.5)	0	0.0 (0.0-0.0)
S	112	16.9 (13.7-20.0)	4	0.6 (0.0-1.2)
SE	112	22.5 (18.3-26.7)	3	0.6 (0.0-1.3)
W	136	30.5 (25.4-35.7)	4	0.9 (0.0-1.8)
IE	**730**	**15.9 (14.8-17.1)**	**22**	**0.5 (0.3-0.7)**

2015; 37.9% and 33% reported these exposures, respectively. According to CSO data, in the general population, around 10.1% of households are served by private wells, indicating that, on a national basis, exposure to private wells appears to be more common among VTEC cases than among the general population.

Unlike salmonellosis, foreign travel plays only a minor role in VTEC infection in Ireland, with the majority of infections acquired indigenously (>97%).

Where the information was available, just under a fifth of VTEC cases in 2015 were attending a childcare facility (CCF). When these analyses were restricted to notified VTEC under five years of age, 43.2% reported attendance at a childcare facility. This is similar to the proportion of children in the general population who use non-parental childcare (42%) as reported by the Central Statistics Office.[11]

Outbreak and environmental investigations

The outbreak surveillance system plays a key role in our understanding of the transmission of VTEC infection in Ireland. Ninety-one VTEC outbreaks were notified in 2015, which included 280 of the 730 VTEC notifications. Forty-one outbreaks were due to *E. coli* O26, 18 to *E. coli* O157, 16 were mixed *E. coli* strain outbreaks, and 16 were caused by other VTEC strains.

The majority of outbreaks (n=78, 86%) were family outbreaks, with 13 general outbreaks also notified. The 73 family outbreaks resulted in 148 persons becoming ill, an average of 1.95 (range 1-7) persons ill per outbreak. The 13 general outbreaks resulted in 84 persons becoming ill, an average of 7 (range 1-44) persons ill per outbreak.

Seventy-four outbreaks occurred in private homes, eight involved extended families, five involved childcare facilities, three were community outbreaks and one was in a residential institution.

The suspected modes of transmission are listed in Table 6.

Person-to-person spread is consistently the most common mode of VTEC transmission reported in Ireland, particularly between young children, and was suspected to have played a role in 51 (56%) VTEC outbreaks in 2015 in which 114 persons were reported ill (Table 6 and Figure 5). Thirty-four of these outbreaks were reported as being solely due to person-to-person transmission, including two outbreaks which occurred in CCFs.

Waterborne transmission was reported to have contributed to 19 outbreaks (21%) with 82 persons ill.

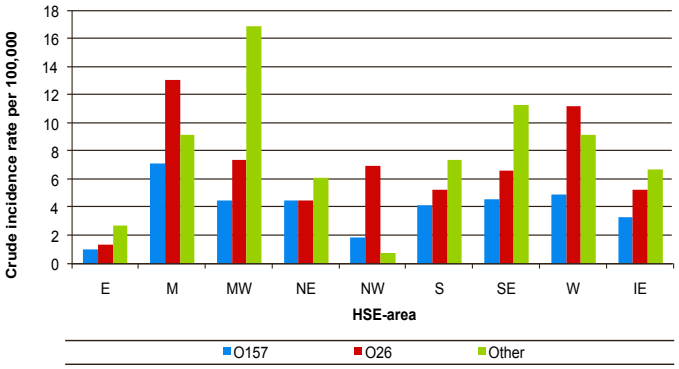

Figure 4: Crude incidence rate VTEC O157, O26 and other serogroups by HSE area, Ireland, 2015
For simplicity mixed infections were recorded as O157 if at least one strain was O157, as O26 if at least one strain was O26 but not O157, and as Other if only non-O157 or non-O26 strains were detected.

Table 4. Serotype and verotoxin (vt) profiles for strains associated with laboratory confirmed VTEC cases, as determined at the VTEC-NRL at PHL, Cherry Orchard Hospital, 2015

Serogroup	vt1	vt2	vt1 + vt2	Not reported	Total
O26	77	11	152	1	**241**
O157	-	117	32	1	**150**
O145	1	35	5	-	**41**
O103	13	2	-	-	**15**
O146	10	-	1	-	**11**
O5	6	-	3	-	**9**
O78	6	1	-	-	**7**
O111	3	-	3	-	**6**
O128ab	-	2	4	-	**6**
O177	2	4	-	-	**6**
O182	6	-	-	-	**6**
O84	6	-	-	-	**6**
O91	1	2	2	-	**5**
O76	2	-	2	-	**4**
O8	-	3	-	-	**3**
O108	2	-	-	-	**2**
O113	-	1	1		**2**
O117	2	-	-	-	**2**
O128ad	-	2	-	-	**2**
O98	2	-	-	-	**2**
O101	-	1	-	-	**1**
O105	-	1	-	-	**1**
O105ac	-	1	-	-	**1**
O117:H17	-	1	-	-	**1**
O126	-	1	-	-	**1**
O130	-	1	-	-	**1**
O136	1	-	-	-	**1**
O136:H12	-	1	-	-	**1**
O141	-	1	-	-	**1**
O149	1	-	-	-	**1**
O150	-	-	1	-	**1**
O156	-	1	-	-	**1**
O174	1	-	-	-	**1**
O178	1	-	-	-	**1**
O185	1	-	-	-	**1**
O186	-	-	1	-	**1**
O2	-	1	-	-	**1**
O22	1	-	-	-	**1**
O71	-	-	1	-	**1**
O74	-	-	1	-	**1**
O87	1	-	-	-	**1**
OE11362-78	-	1	-	-	**1**
OE7477-77	1	-	-	-	**1**
Ungroupable/ unidentifiable	47	33	67	3	**150**
Mixed	-	2	2	-	**4**
Total	**194**	**226**	**278**	**5**	**703**

This is higher than the number of waterborne VTEC outbreaks reported in 2014 (n=9) and 2013 (n=8) but similar to the number reported in 2012 (n=21) (Figure 6). Of the 19 outbreaks with links to waterborne transmission, 16 were family outbreaks with exposure to private wells reported in 13 of these and three were general outbreaks. One of the three general outbreaks occurred in the community resulting in 44 people ill and was linked to a private group water scheme.

Similar to 2014, in 2015 animal/environmental contact was reported to have contributed to nine outbreaks (9.9%) with 20 persons ill. All occurred in private houses (Figure 6).

One outbreak (family outbreak, 2 persons ill) was reported as foodborne and linked to unpasteurised cheese while another family outbreak with three persons ill was reported as food/waterborne, where the individuals had been exposure to unpasteurised milk and water from a private well.

For 31% (n=28) of VTEC outbreaks in 2015, the transmission route was reported as unknown (Table 6 and Figure 6).

Summary

The number of VTEC notifications in Ireland continued to rise (but not significantly) in 2015. Within the European Union, Ireland continues to have the highest incidence rate for VTEC, reporting over seven times the European average in 2015.[3]

The upward trend observed in Ireland in recent years of non-O157 notifications continued in 2015 and reflects the more widespread use by the primary hospital laboratories, of diagnostic methods that detect a broader range of *E. coli* serogroups and the use of more sensitive molecular methods that detect verotoxin genes directly in stool samples[12] Furthermore, national guidance developed for the laboratory diagnosis of human VTEC in Ireland provides a co-ordinated approach to VTEC diagnosis in Ireland.[13]

Foodborne transmission was the first recognised transmission route for VTEC infection historically, with minced beef, unpasteurised dairy products, and fresh produce consumed raw all having been implicated in outbreaks across the world. Foodborne outbreaks typically comprise a small percentage of the total number of VTEC outbreaks in Ireland and 2015 was not an exception with foodborne outbreaks comprising 2.2 % of the VTEC outbreaks notified.

Transmission by person-to-person spread, however, remained the most common transmission route reported in VTEC outbreaks and was involved in 56% of outbreaks. As usual, person-to-person spread was most frequently associated with private house and childcare facility outbreaks. Hand-washing and exclusion of cases in risk groups from high risk settings remains a key prevention measures for VTEC.[14]

In 2015, after person-to person spread, contaminated drinking water was the second most commonly suspected mode of transmission. As in previous years, the majority of the drinking-water associated outbreaks reported were linked with private water supplies and one outbreak was

Table 5. Number of cases of VTEC (and percentage where information available) for selected risk factors, Ireland, 2015 (n=730)

Risk factor	Yes (% of known)	No	Unknown or not reported
Food suspected	27 (5.4)	473	230
Exposure to farm animals or their faeces	245 (37.9)	402	83
Exposure to private well water[a]	215 (33.0)	437	78
Travel-associated[b]	18 (2.7)	645	67
Attendance at a CCF[c]	112 (18.8)	485	133
Attendance at a CCF[c] (among <5 yrs)	104 (43.2)	137	49

[a]Composite variable recoded from two different water supply exposure enhanced variables in CIDR
[b]Inferred from CIDR core variable *Country of Infection*
[c] *CCF=childcare facility*

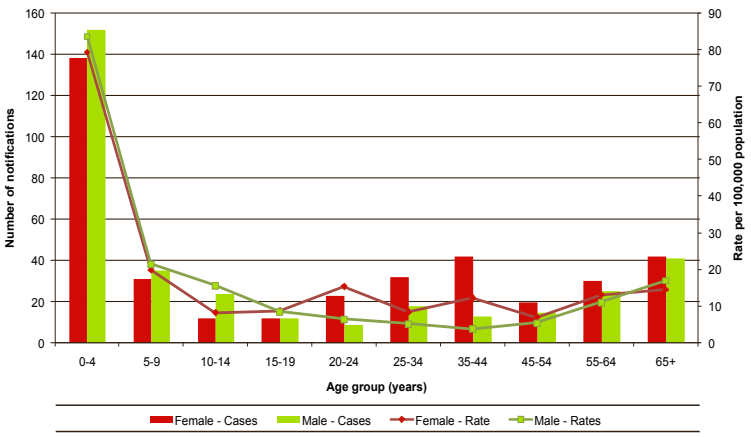

Figure 5. Age-sex distribution VTEC notifications, Ireland, 2015

linked to contaminated water from a private group water scheme. Exposure to water from contaminated untreated or poorly treated private water supplies has historically been recognised as a strong risk factor for VTEC infection in Ireland.[6-8, 15]This has been particularly pronounced following periods of heavy rainfall.

Animal/environmental contact was reported as the third most common route of transmission for VTEC outbreaks in 2015. This has long been recognised as a risk factor for VTEC infection [9-10] and cases due to this transmission route are not unexpected in Ireland given the large cattle population, the high proportion of rural dwellers, and the large number of farming families.[8] Fortunately, none of these animal contact outbreaks were associated with public venues such as open farms, and so the numbers of people affected were small. Advice is available on the HPSC website on how to minimise the risk of gastrointestinal infections following exposure to farm animals and environments, and for the safe recreational use of farmland.[16]

The focus for reducing the incidence of VTEC should be on reducing person-to-person and waterborne transmission. Efforts should focus initially on publicizing materials already developed in Ireland, including national guidance for crèche owners on the management of infectious-disease spread in CCFs[17], guidance for public health professionals on the management of VTEC cases and outbreaks in CCFs[14] and a leaflet developed for well owners outlining the infectious disease risks associated with drinking water from private wells, providing advice on actions that can be taken and what to do in the event the well water is contaminated.[18]

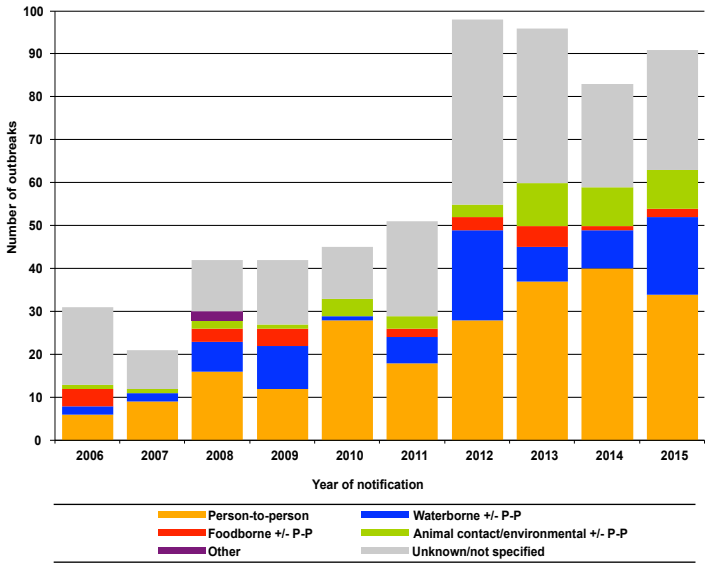

Figure 6. Number of VTEC outbreaks by suspected transmission route and year, Ireland, 2006-2015

Note: In this figure, reported transmission routes were grouped for simplicity. Any outbreak where food contributed was reported as foodborne, any outbreak where water contributed was reported as waterborne, any other outbreak where animal contact contributed was reported as animal contact. Person-to-person outbreaks include only those outbreaks reported as being due only to person-to-person transmission

Table 6. VTEC outbreaks by suspected mode of transmission, Ireland, 2015

Transmission route	Number of outbreaks	Number ill	Number of associated CIDR events[a]
Person-to-person	34	73	83
Foodborne	1	2	2
Waterborne	8	55	57
Person-to-person and waterborne	10	24	29
Foodborne and waterborne	1	3	3
Animal contact	2	3	4
Person-to-person and animal contact	7	17	17
Unknown	28	55	85
Total	**91**	**232**	**280**

[a] These figures may differ from the number ill, as asymptomatic cases identified as a result of screening will also be reported in CIDR

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3.4 Hepatitis A

Summary

Number of cases, 2015: 36
Crude notification rate, 2015: 0.8/100,000 population
Number of cases, 2014: 21

Hepatitis A virus causes an acute, usually self-limiting disease of the liver. It is primarily transmitted from person to person via the faecal-oral route and is associated with poor hygiene and sanitation. Common source outbreaks due to contaminated food or water also occur.

The incidence of hepatitis A in Ireland has been low in recent years and remained low in 2015, with 36 cases notified (0.8/100,000 population) (figure 1). Although this was an increase compared to 2014 (n=21, 0.5/100,000 population), the number of cases of hepatitis A fluctuates from year to year. The average number of cases notified annually over the past ten years was 38 (median: 39). Case classification was reported for all cases and thirty four (94%) were laboratory confirmed. The notification rate in each HSE area is shown in figure 2.

Fifty six percent (n=20) of cases were male and 44% (n=16) were female. The highest notifications rates were in children

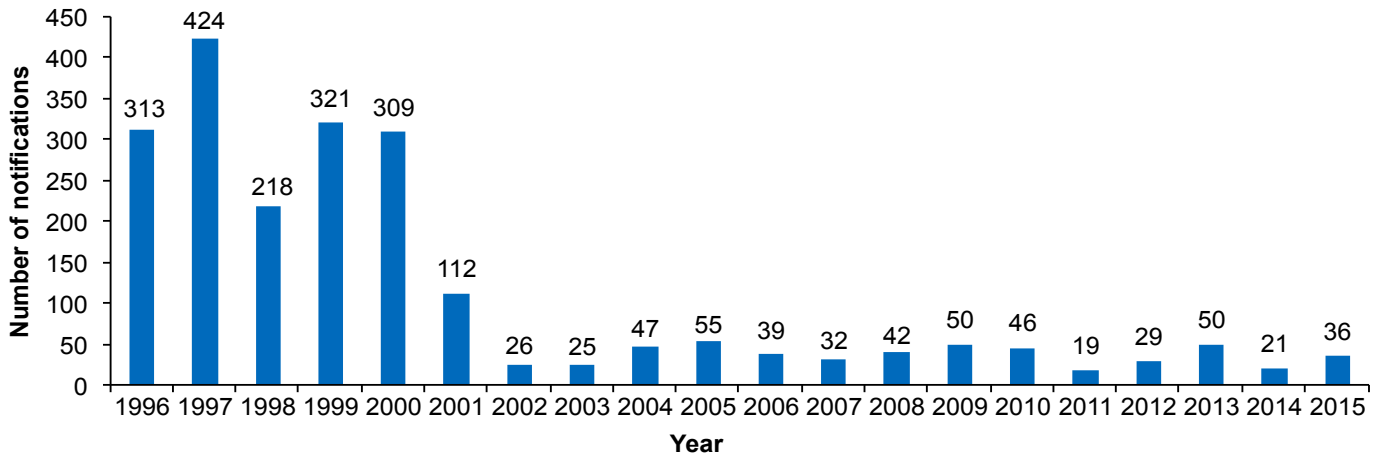

Figure 1. Number of hepatitis A notifications, 1996-2015

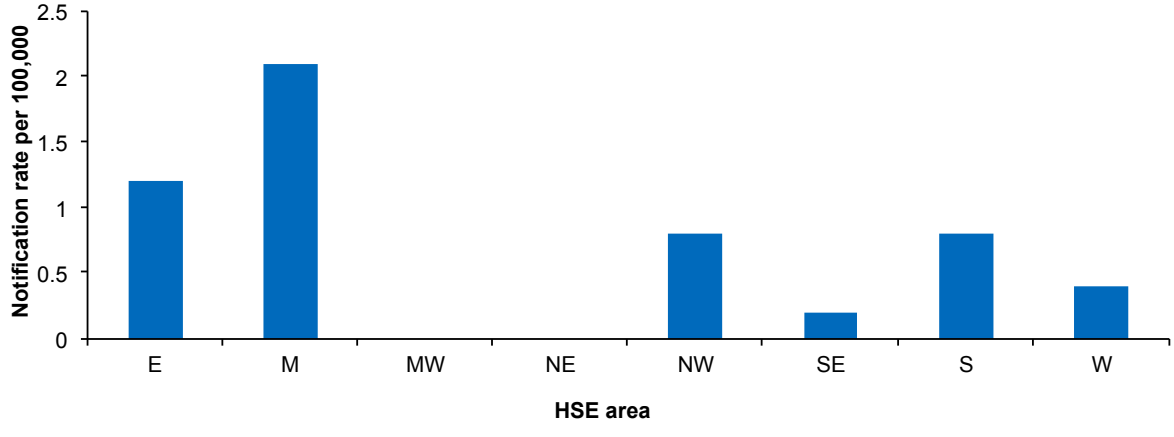

Figure 2. Notification rate for hepatitis A by HSE area, 2015

and young adults, with 61% (n=22) of cases aged between 0 and 24 years (figure 3). Almost half of the 2015 cases (n=17) were notified in April and May, but a large proportion of these were part of a single outbreak.

Overall, thirteen cases were linked to travel outside of Ireland. Nineteen cases were reported as infected in Ireland, but three of these were part of an outbreak where the index case was infected outside Ireland. Country of infection was not known for the remaining four cases.

Three hepatitis A outbreaks were reported in 2015. The largest involved 7 adults and 4 children and was an extended family and local community outbreak linked to a crèche in the HSE-E. In an outbreak in the HSE-M, involving 4 children, the index case had travelled to Pakistan and the remaining cases were infected through person-to-person contact in Ireland. The remaining outbreak involved two children in the HSE-E and was linked to travel to Sudan.

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) System on 21st September 2016. These figures may differ from those published previously due to ongoing updating of notification data on CIDR.

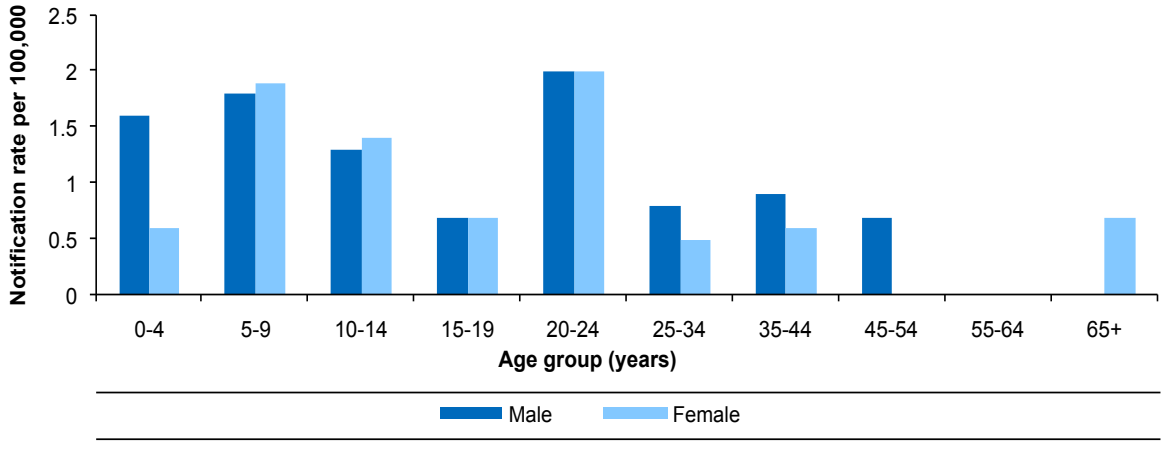

Figure 3. Hepatitis A age and sex-specific notification rates/100,000 population, 2015

3.5 Rotavirus

Summary

Number of cases:	4,158
Crude incidence rate:	90.6/100,000 population

Rotavirus is the commonest global cause of paediatric gastrointestinal infection and causes sporadic, seasonal and occasionally severe gastroenteritis of infants and young children, characterised by vomiting, fever and watery diarrhoea. Transmission is usually person-to-person, mainly via the faecal-oral route. Children less than two years of age are most susceptible to infection, although cases are often seen in elderly and immunocompromised adults, particularly in institutional settings. By the age of six years, virtually all children will have had at least one episode of rotavirus infection. Symptoms usually last for only a few days but in severe cases hospitalisation may be required due to dehydration.

Prior to 2004, rotavirus cases were notified under the "Gastroenteritis in children under two years" disease category. From 2004 to 2010, rotavirus was notifiable in all age groups under the "Acute Infectious Gastroenteritis" (AIG) disease category, until it became notifiable as a disease in its own right under the Infectious Diseases (Amendment) Regulations 2011 (S.I. No. 452 of 2011). Since March 2013, rotavirus notifications from HSE-East are based on laboratory testing results rather than patient episodes. Notifications from HSE-E may also refer to area of laboratory testing rather than area of patient residence.

During 2015, there were 4,158 cases of rotavirus notified in Ireland, corresponding to a national crude incidence rate (CIR) of 90.6 per 100,000 population (figure 1).* This is the highest number of cases reported since surveillance began in 2004, and represents an increase of 75.9% compared to the mean CIR during 2004-2014 (51.5).

Significant geographical variation was observed in regional rotavirus CIR. The highest regional CIRs were observed in HSE-M (120.0), -W (114.5) and -SE (112.7). The lowest regional CIR was observed in HSE-MW (65.1) and HSE-NW (76.3).

* All rates are per 100,000 population

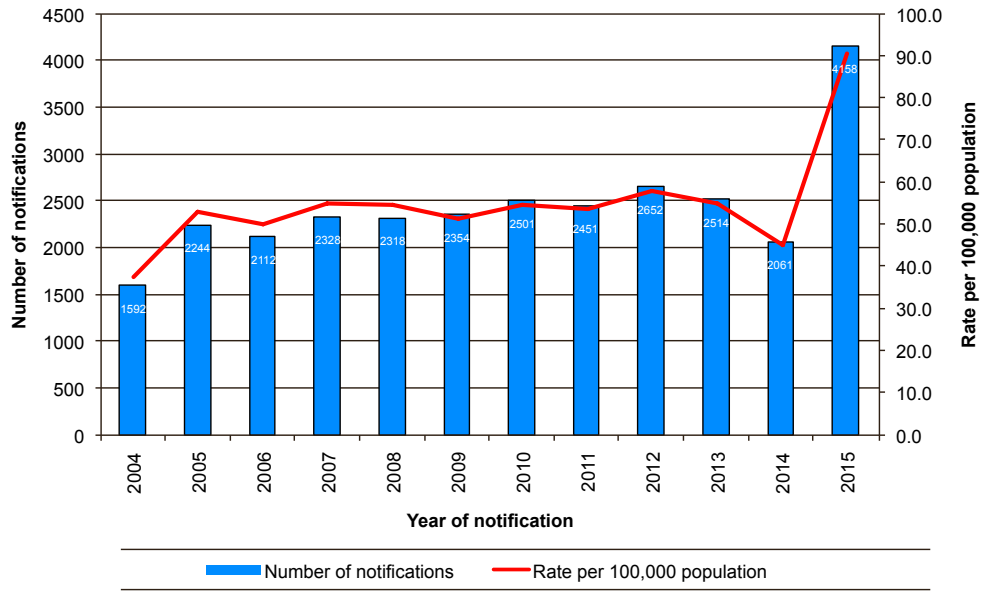

Figure 1: Number of rotavirus notifications and crude incidence rate per 100,000 population by year (CIDR)

Rotavirus infection has a well-documented seasonal pattern in Ireland with the number of cases typically peaking during March to May. During 2015, rotavirus notifications peaked during March (n=847) and April (n=987). Figure 2 illustrates the seasonal variation in rotavirus cases by month of notification for 2015 compared to the mean monthly number of notifications reported during 2004 to 2014.

During 2015, 1,962 cases (47.2%) were female and 2,192 (52.7%) were male. Sex was not reported for the remaining four cases.

Six outbreaks of rotavirus were notified during 2015 with 42 cases of associated illness, eight of whom were hospitalised. Two general outbreaks occurred in child-care facilities. The remaining four outbreaks were family outbreaks that occurred in private homes. All outbreaks reported mode of transmission as person to person spread.

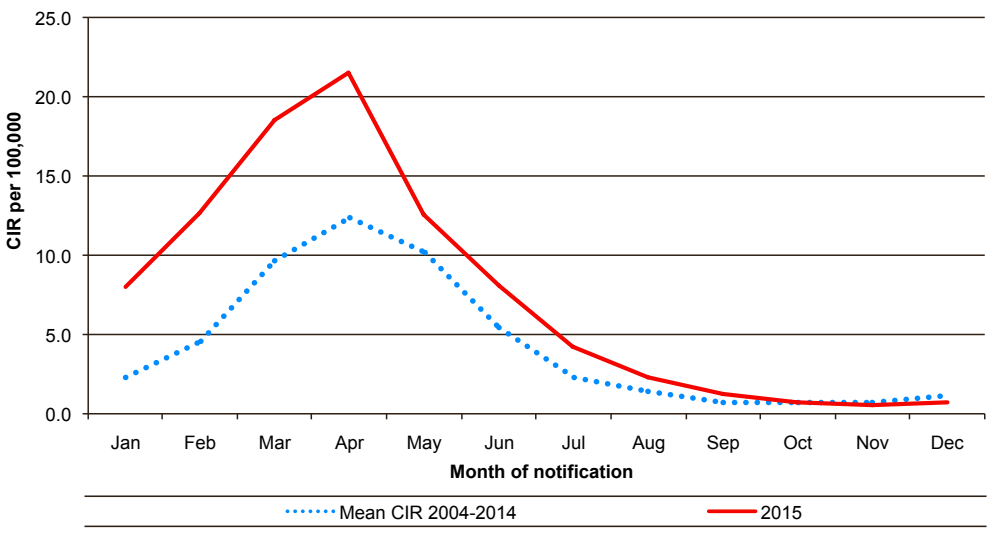

Figure 2: Rotavirus CIR by month (CIDR)

3.6 Salmonella

Summary

Number of confirmed cases: 269

Crude incidence rate: 5.9/100,000 population[1]

Salmonellosis typically presents clinically as an acute enterocolitis, with sudden onset of abdominal pain, diarrhoea, nausea, headache and occasionally vomiting. Fever is almost always present. Dehydration, especially amongst vulnerable populations such as infants, the immunocompromised and the elderly, may be severe. Invasive infection occurs in a proportion of cases. *S.* Typhi and *S.* Paratyphi can cause enteric fever, a severe systemic life threatening condition, but these are not common in Ireland and are almost invariably travel-associated.

The common reservoirs for non-typhoidal *Salmonella* are the intestinal tract of domestic and wild animals (including birds), which may result in a variety of foodstuffs, of both animal and plant origin, becoming contaminated with faecal organisms either directly or indirectly. The organism may also be transmitted through direct contact with infected animals or humans or faecally contaminated environments. Infected food handlers may also act as a source of contamination for foodstuffs. Of particular concern is the number of cases of infection associated with direct contact with reptiles kept as companion animals.

During 2015, 269 cases of salmonellosis were notified, corresponding to a crude incidence rate (CIR) of 5.9 per 100,000 population (figure 1). The annual CIR has remained consistently low over the last five years (2010-2014 mean: 6.8) compared to the previous five year (2005-2009: 9.3). The highest CIR in 2015 occurred in HSE-W (7.0) and the lowest in HSE-NW (3.9).

The highest age-specific incidence rate among both sexes was in children under 5 years of age (15.2). This is likely to be influenced by clinicians more readily seeking clinical samples in that age group. The lowest age specific rate was observed in the 35-44 year age group (2.4).The male to female ratio was equal in all age groups apart from the 25-34 year age group (0.5:1.0) and the 45-54 year age group (1.4:1.0).

Foreign travel as a risk factor for salmonellosis in Ireland

Country of infection was reported for over 90% of notifications in 2015. Where country of infection was reported, 45.5% of cases were travel associated. The number of travel associated cases peaked during the period August to October while indigenous cases peaked during September to November (Figure 2). High numbers of indigenous

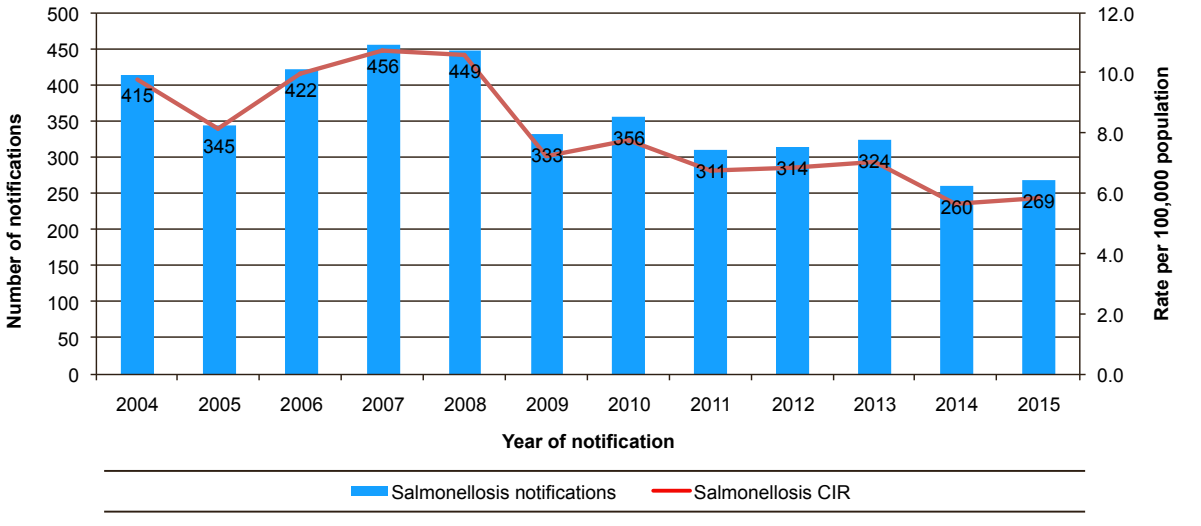

Figure 1: Salmonellosis notifications and CIR by year of notification (CIDR)

cases were also observed in April and June. Among travel associated cases, the most common countries of infection reported were: Spain (n=22), Poland (n=9) and Thailand (n=8). The popularity of a country as a travel destination is likely to be an important factor in determining the number of cases associated with each country.

When serotyping data were analysed by travel history, almost half of all indigenous cases were infected with *S.* Typhimurium (or monophasic *S.* Typhimurium), with 'Other' serotypes making up a further 36.1% of cases. In contrast, *S.* Enteritidis features more prominently among travel-associated cases (36.0%) with just 15.8% of indigenous cases due to *S.* Enteritidis (table 1).

Typhoid/Paratyphoid:
In 2015 nine cases of typhoid and one case of paratyphoid (Paratyphi B) were notified. Of the nine *S.* Typhi cases, two each had travelled to India and Pakistan, one each to Bangladesh, Nigeria and Uganda. The remaining two typhoid cases did not report country of infection. The paratyphoid case reported travel to Bolivia.

National *Salmonella*, *Shigella* and *Listeria* Reference Laboratory (NSSLRL) data:
The National *Salmonella*, *Shigella* and *Listeria* Reference Laboratory (NSSLRL) based in Galway has been providing reference services nationally since 2000. In 2015, the NSSLRL analysed 272 human *Salmonella* isolates referred for further typing, including six typhoid and one paratyphoid. Figure 3 shows the trend in referral of isolates to NSSLRL by organism over time.

The NSSLRL conducted phage typing analysis on all 94 *S.* Typhimurium and all 68 *S.* Enteritidis isolates. Phage type DT193 (n=21) comprised 22.3% of all *S.* Typhimurium strains. Other currently important *S.* Typhimurium phage types included Untypable (14.9%) and DT104 (6.4%). Phage types

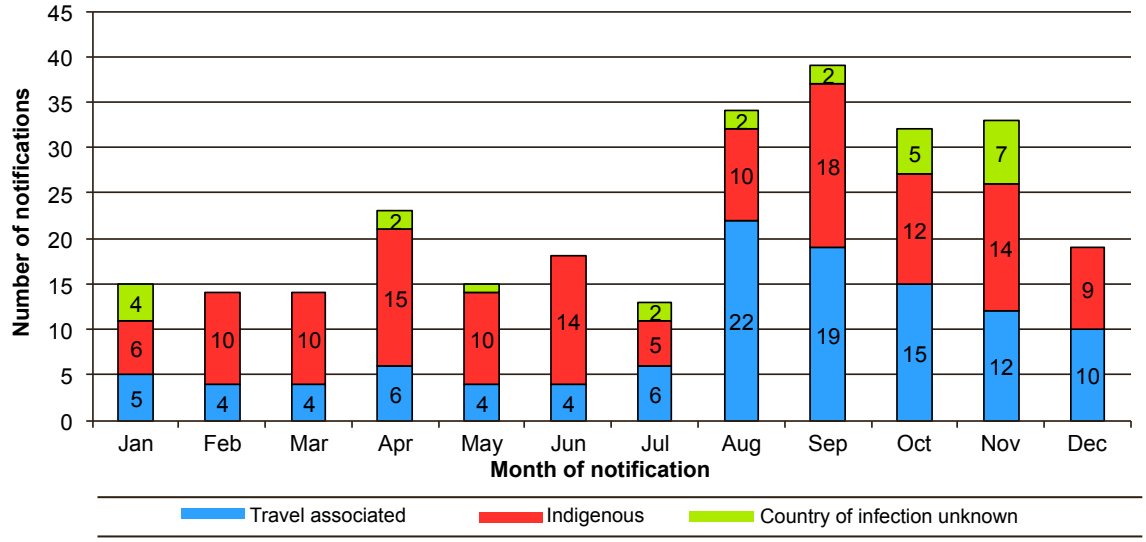

Figure 2: Salmonellosis notifications by month of notification and travel history, 2015 (CIDR)

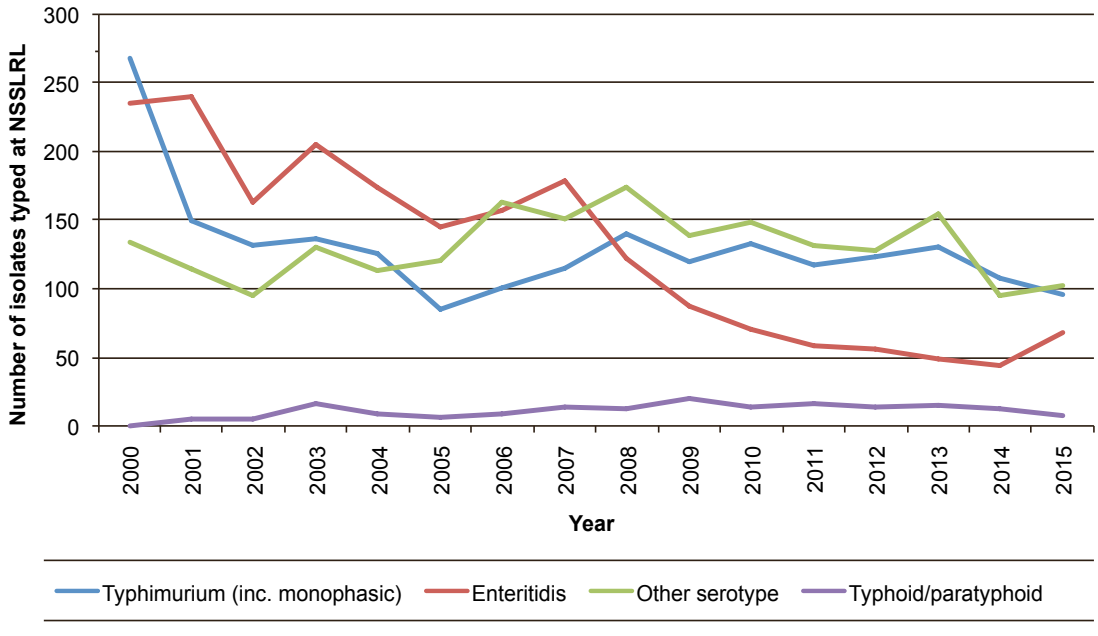

Figure 3: Annual number of Salmonella isolates referred to NSSLRL by serotype (NSSLRL)

PT21 (23.5%), PT8 (17.6%) and PT1 (16.2%) were the most common phage types observed among *S.* Enteritidis isolates.

Of the 272 isolates analysed for antimicrobial resistance, 137 (50.4%) were fully susceptible to all antimicrobials tested. The remaining 135 isolates exhibited some degree of antimicrobial resistance across 47 antibiograms. Thirty-seven isolates exhibited resistance to five or more antimicrobials among 25 antibiograms. The majority of isolates exhibiting this level of resistance were *S.* Typhimurium (54.1% of multi-drug resistant isolates). Overall, the commonest resistance pattern seen was resistance to ampicillin, streptomycin, sulphadiazine and tetracycline (ASSuT, n=35, 25.9% of resistant isolates). The ASSuT pattern was identified exclusively in *S.* Typhimurium isolates. Resistance to nalidixic acid and ciprofloxacin (NaCp, n=24, 17.8% of resistant isolates) was the second most common AMR profile among all isolates, This pattern was identified mainly in *S.* Enteritidis isolates (79.2%). The NSSLRL's Annual Report 2015 provides a more detailed analysis of clinical *Salmonella* typing results and a comparison with isolates from non-human sources.[1]

Outbreaks

During 2015, nine outbreaks of salmonellosis were reported, comprising 22 cases of illness and one travel associated outbreak of typhoid with three associated cases of illness. Six family outbreaks occurred in private houses. Two general outbreaks occurred in community settings and one general outbreak occurred in a hospital. Four outbreaks were reported as due to person to person spread and one was due to animal contact while mode of transmission for the remaining four outbreaks was reported as unknown.

In consequence of the increasing recognition in recent years of fresh produce as a cause of gastrointestinal disease outbreaks, the National *Salmonella* Outbreak Trawling Questionnaire was recently expanded and updated. The form is available at http://www.hpsc.ie/A-Z/Gastroenteric/Salmonellosis/SurveillanceInvestigativeForms/

References:

1. National *Salmonella* Reference Laboratory of Ireland, Annual Report for 2015. Available at: http://www.nuigalway.ie/research/salmonella_lab/reports.html

Table 1: Salmonellosis notifications by serotype and travel history, 2015 (CIDR)

***Salmonella* serotype**	**Travel associated**		**Indigenous**		**Travel history unknown**	
	Number	%	Number	%	Number	%
S. Typhimurium	21	*18.9*	64	*48.1*	6	*24.0*
S. Enteritidis	40	*36.0*	21	*15.8*	8	*32.0*
Other serotypes	50	*45.0*	48	*36.1*	11	*44.0*
All serotypes (n)	**111**	***100.0***	**133**	***100.0***	**25**	***100.0***

3.7 Less common gastroenteric infections

Listeriosis

In 2015, 19 cases of listeriosis were notified, an increase compared to 2014 and 2013 when 15 and 8 cases were reported, respectively. For 2015, this equates to a crude incidence rate of 0.41 per 100,000 population which remains below the EU average of 0.48 per 100,000 for the same year.[1]

In 2015, two neonatal cases and three pregnancy-related cases were reported (Figure 1). The number of adult/juvenile cases reported in 2015 increased by 75% (n=14) compared with 2014 (n=8) and it was the highest since listeriosis became notifiable as a specified disease in 2004 (Figure 1). Eight of the fourteen adult/juvenile cases were male, cases ranged in age from 16 months to 87 years and 64% (n=9) of these cases were 65 years of age and older. Five adult/juvenile cases had septicaemia, three had meningitis and two had both. Two patients died, one death was due to listeriosis and for the second death the cause of death was unknown but the patient had an underlying illness.

Since 2007, the National *Salmonella, Shigella* and *Listeria* Reference Laboratory (NSSLRL) in Galway provides a national service for the typing of *Listeria* strains. In 2015, isolates from fifteen of the 19 notified cases were referred by the primary laboratories for serotyping. Serotype 4b was the most common (n=8) followed by serotype 1/2a (n=6) (Table 1).

In Ireland, listeria remains a hazard for the elderly, persons with underlying illness, and other vulnerable groups such as pregnant women and neonates.

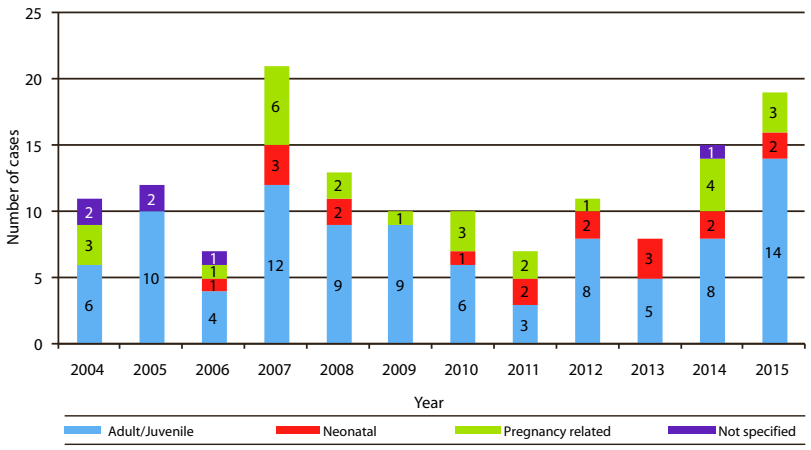

Figure 1: Number listeriosis notifications by case type, Ireland, 2004-2015

*Table 1: Listeriosis notifications by case type and serotype, Ireland, 2015**

Type	Serotype 1/2a	Serotype 1/2b	Serotype 4b	Not referred for serotyping	Total
Adult or juvenile	5	1	5	3	**14**
Pregnancy-related	0	0	2	1	**3**
Neonatal	1	0	1	0	**2**
Total	**6**	**1**	**8**	**4**	**19**

* Typing data provided by the National Salmonella, Shigella and Listeria Reference Laboratory (NSSLRL)

Giardiasis

In 2015, there were 146 cases of giardiasis notified, corresponding to a crude incidence rate (CIR) of 3.2 per 100,000 population and representing a doubling of CIR. This increase appears to be largely due to the introduction of molecular methods for multi-pathogen screening of stool samples during 2015. In a recent laboratory survey conducted by HPSC, seven laboratories reported the introduction of such methods during 2015. This is likely to have led to an increased number of stool specimens tested for Giardia since 2015.

Cases ranged in age from one month-90 years with a median age of 30 years. Between 2004 and 2014, the highest age specific incidence rates (ASIR) occurred in the 0-4 years age group (mean = 3.0/100,000). This increased from 3.6 in 2014 to 7.0 in 2015. The 2nd highest ASIR in 2015 was observed in those aged 25-34 years at 4.8, an increase compared to 2.6 in 2014 and a mean ASIR of 2.0 between 2004 and 2014. Other age groups that reported large increases in the ASIR during 2015 compared to the mean ASIR between 2004 and 2014, were those aged 5-14 years (2015: 7.0 vs mean 3.0) and those aged 65 years and older (2015: 3.0 vs mean: 0.5).

The male to female ratio was 1.5:1.0, but was higher for non-travel associated cases (1.9:1.0) compared to travel associated cases (1.2:1.0). The majority of cases were diagnosed in GP patients (60.0%).

Country of infection was reported for 66.2% of cases in 2015, a decrease compared to 69.0% in 2014 (Figure 2). Of the 96 cases where country of infection was reported 47 (49.0%) were reported as being associated with foreign travel. The most commonly reported countries of infection were India (n=13) and Spain (n=6), two cases each were reported from Lebanon and Pakistan and there was one case each reported associated with travel to 12 other countries. Forty-nine cases (51.0%) were reported as being acquired in Ireland, a marked increase compared to 32.7% in 2014. The remaining 49 cases (33.8%) did not report country of infection.

Four family outbreaks of giardiasis were notified in 2015, all of which occurred in private houses. Three outbreaks reported waterborne transmission and one was considered to be due to person to person transmission.

Yersiniosis

In 2015, there were 13 cases of yersiniosis reported, a sharp increase compared to five cases reported in 2014 and four cases in 2013. This increase is mainly due to a research project in a regional laboratory which used a molecular method for multi-pathogen screening of faecal samples during 2014. This research resulted in an unexpectedly high yield of *Yersinia* positive specimens which prompted further testing during 2015. Table 2 outlines the age and sex distribution of cases in 2015. One was reported as being infected with *Y. pseudotuberculosis* and 12 were *Y. enterocolitica*. The reported incidence of yersiniosis in Ireland is low relative to the EU as a whole, and to Northern Europe in particular.

Table 2: Number of yersiniosis notifications by sex and age group, 2015

Age group	Female	Male	Total
0-4 yrs		2	**2**
5-14 yrs	1	3	**4**
25-34 yrs	1	1	**2**
45-54 yrs		1	**1**
55-64 yrs		1	**1**
65+ yrs	1	2	**3**
Total	**3**	**10**	**13**

Foodborne intoxications

Notifications of foodborne intoxications in Ireland are uncommon. There was one case of *Bacillus cereus* foodborne infection notified in an infant in 2015. There were no cases or outbreaks of botulism, *Clostridium perfringens* (type A) food-borne intoxication or staphylococcal food poisoning notified in 2015.

References

1. ECDC. Surveillance Atlas of Infectious Diseases. Available at http://atlas.ecdc.europa.eu/public/

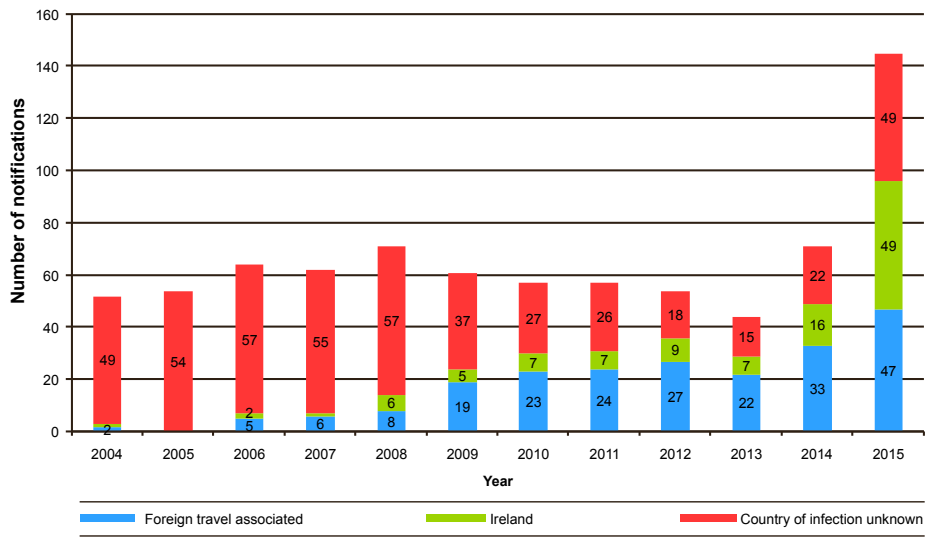

Figure 2: Number of giardiasis notifications by country of infection, 2004-2015

3.8 Shigellosis

Summary

Number of notifications: 90
Crude incidence rate: 2.0/100,000

Ninety cases of shigellosis were notified in Ireland in 2015, corresponding to a crude incidence rate (CIR) of 2.0 per 100,000. This represents an increase of 58% compared to 2014. Of 85 cases where hospitalisation status was recorded, 17 (20%) were reported as hospital in-patients. Of the 90 cases, 87 were laboratory confirmed.

During 2015, there was an excess of male cases compared to females, with a male to female ratio of 2.1:1.0. This trend has been observed since 2009 with the exception of 2013 where more females were notified (figure 1). During 2015, cases ranged in age from 1 month to 95 years (median age=34 years). The male to female ratio was highest in the age groups 15-24 years (3.0:1.0), 25-34 years (3.2:1.0) and 35-44 years (3.0:1.0). Of the 26 cases that were reported as indigenous, 76.9% were male which compares to 53.3% of travel associated cases (table 1).

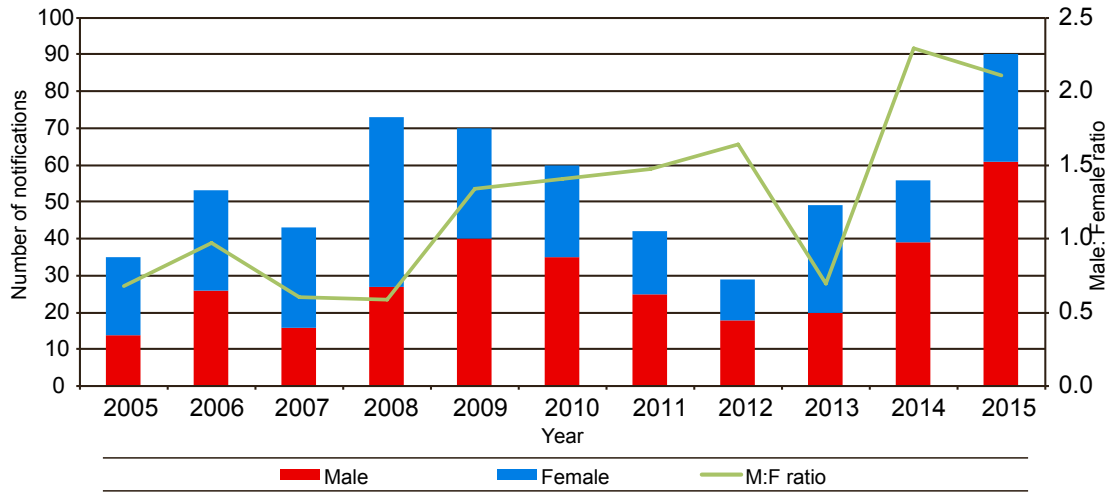

Figure 1: Annual number of notifications shigellosis by sex and year (Data source: CIDR)

Table 1: Number of notifications shigellosis by travel association, age group and sex, 2015 (Data source: CIDR)

2015	Travel associated		Indigenous		Travel history unk		Total notifications			
	F	M	F	M	F	M	F	M	Total	M: F ratio
0-4 yrs	2	2	2	1	1	2	5	5	**10**	1.0
5-14 yrs	2	3	1				3	3	**6**	1.0
15-24 yrs	2	3		3			2	6	**8**	3.0
25-34 yrs	5	4		8	1	7	6	19	**25**	3.2
35-44 yrs	3	6	1	4		2	4	12	**16**	3.0
45-54 yrs	5	2	1	3		4	6	9	**15**	1.5
55-64 yrs	2	3		1		1	2	5	**7**	2.5
65+ yrs		1	1				1	1	**2**	1.0
Age unk						1		1	**1**	
Total	**21**	**24**	**6**	**20**	**2**	**17**	**29**	**61**	**90**	**2.1**
M:F ratio	*1.1: 1.0*		*3.3: 1.0*		*8.5: 1.0*		*2.1: 1.0*			

Table 2: Shigellosis outbreaks 2015 (Data source: CIDR)

HSE-area	Outbreak type	Location	Transmission mode	Number ill	Serotype
HSE-E	General	Community	Person-to-person	28	*S. sonnei* & *S. flexneri*
HSE-W	General	Workplace	Person-to-person	2	*S. sonnei*
HSE-M	Family	Travel-related	Unknown	2	*S. boydii*

Information on travel history is very valuable when reviewing surveillance data for possible indigenous clusters. Data on country of infection was available for 79% of shigellosis notifications this year. Forty-five cases were reported as being associated with foreign travel in at least 23 countries during 2015. Twenty-six cases were reported as being acquired in Ireland, while no country of infection information was available for 19 cases.

S. sonnei was the most common species reported (n=45), followed by *S. flexneri* (n=27). Three *S. boydii* and two *S. dysenteriae* were also reported while species was not reported for the remaining 13 confirmed cases. When analysed by travel association, *S. flexneri* was equally common among indigenous cases (30.8%) as travel associated cases (31.1%). *S. sonnei* was more common among indigenous cases (57.7%) than travel associated cases (42.2%).

Three shigellosis outbreaks were notified in 2015, resulting in 32 cases of illness and five associated hospitalisations. Table 2 summarises the three outbreaks reported during 2015. A large outbreak of shigellosis comprising 28 episodes of illness among 27 individuals, was reported among men who have sex with men (MSM). Infection with multiple serotypes was recorded.

More detailed typing of *Shigella* isolates can provide useful information on the relatedness of strains which can be used by public health personnel to outrule/provide evidence for links between cases during investigations of case clusters. The National *Salmonella*, *Shigella* and *Listeria* Reference Laboratory (NSSLRL) provide laboratory services for speciation, serotyping, antimicrobial resistance profiling, and where appropriate, Pulsed Field Gel Electrophoresis (PFGE) of *Shigella* isolates. The species/serotype and antimicrobial resistance patterns of these cases are reported in Table 3.

During 2015, the NSSLRL reported an increase in specimen referral from regional laboratories. This is likely a result of the increased sensitivity of direct molecular detection methods which were recently introduced by regional laboratories for faecal pathogen screening. [1] An increase in ciprofloxacin resistance among *S. sonnei* isolates has been identified by NSSLRL since 2010; this appears to be particularly evident among isolates originating in South Asia.[1] Further details of *Shigella* strain characterisation performed at NSSLRL can be found in the NSSLRL Annual Report.[1]

Table 3: Species/serotypes and AMR profiles of Shigella isolates referred to NSSLRL in 2015

Serotype	Number by serotype	AMR profile	Number by serotype and AMR profile
Shigella boydii	4	none	1
Shigella boydii		T	2
Shigella boydii 2		STm	1
Shigella dysenteriae	2	ACSSuTTm	1
Shigella dysenteriae		ACSSuTTm-NaCpCtxCef	1
Shigella flexneri	27	ACSSuTTm-NaAzt	1
Shigella flexneri 1b		ACSSuTTm	2
Shigella flexneri 1b		ACSTTmNa	1
Shigella flexneri 1b		ASSuTTm	1
Shigella flexneri 2		SSuTTmNaCp	1
Shigella flexneri 2a		ACSSuTTm	2
Shigella flexneri 2a		ACSSuTTmAzt	2
Shigella flexneri 2a		ACSSuTTm-NaCp	1
Shigella flexneri 2a		ACST	5
Shigella flexneri 2a		ACSTTmNaCp	1
Shigella flexneri 2b		ACSTm	1
Shigella flexneri 3a		ACST	2
Shigella flexneri 3b		ACST	1
Shigella flexneri 4		ACSSuTTm	1
Shigella flexneri X variant		ASSuTTmAzt	3
Shigella flexneri X variant		none	1
Shigella flexneri X variant		T	1
Shigella sonnei	33	ASSuTmGmCtx	1
Shigella sonnei		ASSuTTm-NaAzt	1
Shigella sonnei		ASSuTTm-NaCpCtx	1
Shigella sonnei		ASSuTTm-NaGmCtx	1
Shigella sonnei		SSuTm	1
Shigella sonnei		SSuTTm	13
Shigella sonnei		SSuTTmNa	9
Shigella sonnei		SSuTTmNaCp	1
Shigella sonnei		SSuTTmNaC-pAzt	1
Shigella sonnei		STmNaCp	1
Shigella sonnei		TmNaCp	3
Total	**66**	**Total**	**66**

References

1. National Salmonella Reference Laboratory of Ireland, Annual Report for 2015. Available at: http://www.nuigalway.ie/research/salmonella_lab/reports.html

2015

ANNUAL EPIDEMIOLOGICAL REPORT

04

VECTORBORNE AND ZOONOTIC DISEASES

4.1 Malaria

Summary

Number of cases malaria, 2015: 81
Crude incidence rate malaria 2015: 1.8/100,000

In 2015, 81 malaria cases were notified in Ireland, which remains stable in comparison to 80 cases reported in 2014 (Figure 1). Among European Union (EU) member states reporting malaria data to the European Centre for Disease Prevention and Control, Ireland had the fifth highest incidence rate for imported malaria in 2014 (the latest year for which comparative data are available); only Belgium, Norway, Sweden and the United Kingdom had higher reported incidence rates.

In common with the rest of the EU, males predominated with a male: female ratio of 2.2:1.0. The highest numbers of cases were aged between 25 and 54. The number of paediatric cases reported was 6, a decrease compared to 10 cases reported during 2014 (Figure 1).

Three of the paediatric cases reported "visiting family in country of origin" as their reason for travel and one was an Irish citizen living abroad who had returned to Ireland for a holiday. There was no information on reason for travel for the remaining two paediatric cases. Four paediatric cases visited sub-Saharan Africa while country of infection was not available for the remaining two cases. Only one of the paediatric cases reported taking malaria prophylaxis but this case was not fully compliant, three paediatric cases reported not taking any prophylaxis for their travel, while the remaining two paediatric cases did not have information on prophylaxis reported.

Among all age groups, the category of traveller most affected in Ireland continued to be African immigrants and their families who were exposed while returning to "visit family in country of origin". This almost certainly reflects the greater frequency with which this group travels to malarious areas, but also reflects Ireland's importance as a destination for those emigrating from English speaking West Africa. Where the reason for travel was reported in 2015, 88.5% cited "visiting family in country of origin", all of whom travelled to Africa.

Other reasons cited for travel this year were "Business/ professional travel" (n=2) and "Irish citizen living abroad" (n=1). Three cases reported no recent history of travel, two of whom were relapses. The remaining 52 cases did not report country of infection.

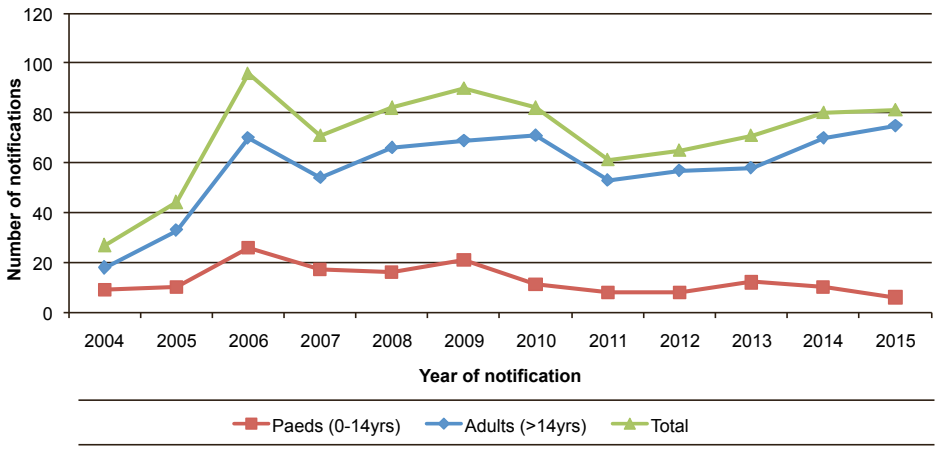

Figure 1: Annual number of malaria notifications by age, Ireland 2004-2015

Nigeria remained the country most frequently visited, accounting for 61.5% of cases where country of infection was reported. The remaining cases were exposed in other countries within Africa. The majority of cases who reported travel to Nigeria were "visiting family in country of origin" (15/16) with known reason for travel.

Plasmodium falciparum accounted for 76.5% of infections in 2015, reflecting the dominance of exposure in Africa as the source of the majority of notifications. Ten cases of *P. ovale*, five cases of *P. vivax*, and one case of *P. malariae* were also reported. This is the highest number of *P. ovale* cases reported since surveillance began. The remaining three cases did not have *Plasmodium* species specified.

HPSC resources for health professionals include a poster which can be downloaded from the HPSC website for display in GP surgeries, maternity hospitals, paediatric hospitals and emergency departments, advising immigrant families travelling to Africa to consult their doctor about malaria before travelling. A leaflet for intending travellers, available in English and French, highlights the value of antimalarial prophylaxis and protection against mosquito bites. The poster and leaflet are available at http://www.hpsc.ie/A-Z/Vectorborne/Malaria/LeafletsandPosters/.

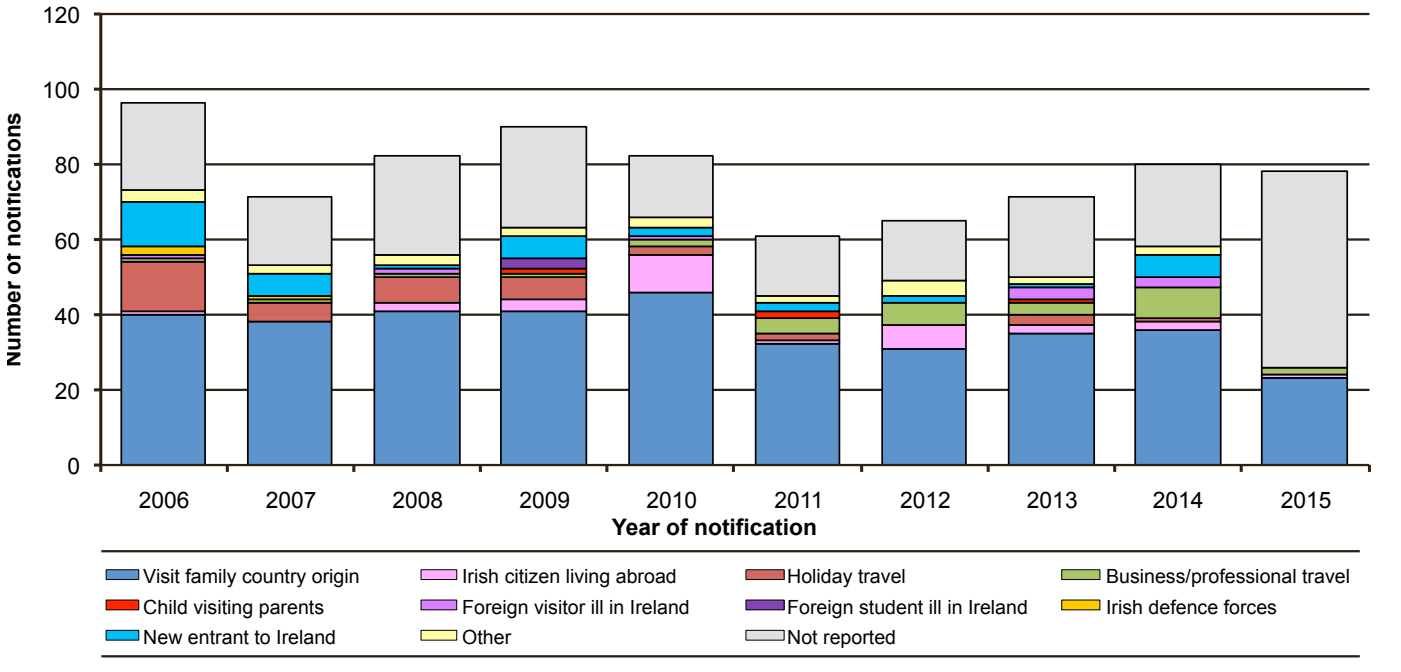

Figure 2: Annual number of notifications malaria by reason for travel, Ireland 2006-2015

4.2 Leptospirosis

Summary

Number of cases: 16
Crude incidence rate: 0.3/100,000 population

Sixteen cases of leptospirosis were notified in Ireland in 2015. This represents a decrease compared to 23 cases notified in 2014 (Figure 1). This equates to a crude incidence rate (CIR) of 0.3 per 100,000 population in 2015. The EU crude incidence rate was 0.2 per 100,000 in 2014, latest year for which data was available for. Among the countries that reported leptospirosis incidence in 2014, Ireland reported the fifth highest incidence rate after Croatia, Slovenia, Portugal and the Netherlands.

The age range of cases was 29-72 (mean age =50 years, median age=51 years). Cases in the younger age groups are more likely to be associated with recreational exposure and history of foreign travel while older cases are mainly indigenous and associated with occupational exposure. Figure 1 illustrates the annual trend by travel history. The leptospirosis notification dataset is typically dominated by adult males, and this year was no exception with male cases accounting for 75% of cases (Table 1).

Five cases (31.3%) were believed to have acquired their illness occupationally, four of whom were either farmers or reported contact with farm environments while the remaining occupationally acquired case reported contact with rat's urine. Two cases (12.5%) reported accidental exposure to potentially contaminated environments while one case (6.3%) was reported as being associated with recreational activities, including river water exposure in Columbia. No risk factors were reported for the remaining eight cases (50.0%). Figure 2 shows the trend in notifications by exposure group and year.

Among the 13 cases for which hospital admission status was reported, 10 (77%) required hospitalisation. One death was reported but the cause of death was not leptospirosis.

Activities that continue to be associated with leptospirosis risk in Ireland include recreational activities such as water sports, and farming. In recent years, travel to Asia and other tropical destinations has emerged as a risk factor for leptospirosis.

Table 1: Leptospirosis notifications by age and sex, 2015

Age group (years)	Female	Male	Total
25-34 yrs	1	2	**3**
35-44 yrs		2	**2**
45-54 yrs	1	3	**4**
55-64 yrs	2	4	**6**
65+ yrs		1	**1**
Total	**4**	**12**	**16**

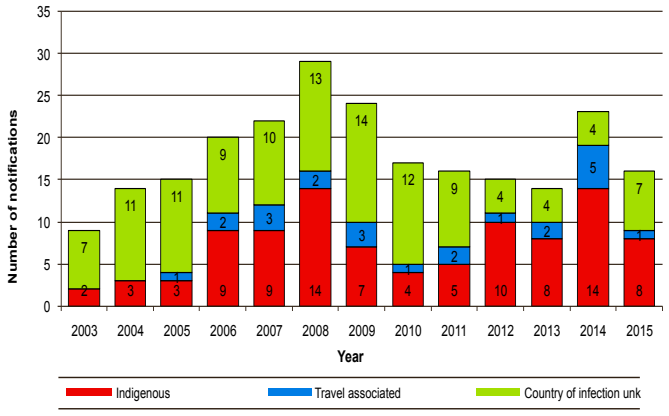

Figure 1: Annual number of leptospirosis notifications by year and travel history (Data source: CIDR)

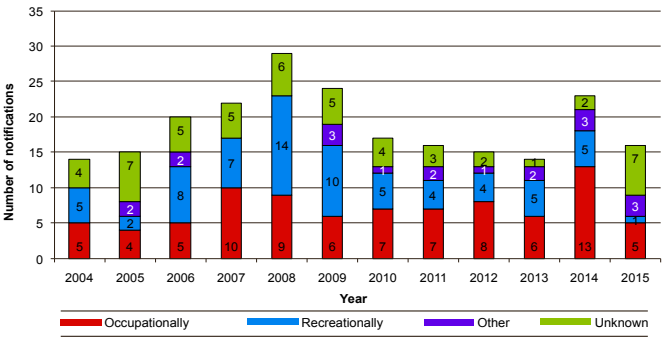

Figure 2: Annual number of leptospirosis notifications by exposure group by year (Data source: CIDR)

4.3 Other Notifiable Non-IID Zoonotic Diseases

Toxoplasmosis

During 2015, 26 cases of toxoplasmosis were notified, remaining slightly lower than the annual mean of 31 notifications in the previous five years. Among cases where patient type was reported, 26.3% were hospitalised. One congenital case was reported.

Cases ranged in age from 0 to 67 years (median: 35 years). As in previous years, more cases were reported among females then males, (F:M ratio 1.4:1.0). This was particularly evident among females in the 25-34 year age group, which is most likely a reflection of enhanced testing during pregnancy (Table 1).

Q Fever

Four cases of Q fever were reported in Ireland in 2015. All cases were male, with a median age of 56 years. Three were from HSE-W and one was from HSE-SE.

Brucellosis,Echinococcosis, Trichinosis and Q Fever

No cases of brucellosis, echinococcosis and trichinosis were notified in Ireland in 2015.

Table 1: Toxoplasmosis notifications by age and sex, Ireland 2015

Age group	Female	Male	Total	Female: Male Ratio
0.-4 yrs		1	1	0.0
10-14 yrs		1	1	0.0
15-19 yrs		1	1	0.0
20-24 yrs	1		1	
25-34 yrs	7	2	9	3.5
35-44 yrs	5	3	8	1.7
45-54 yrs	1		1	
55-64 yrs		2	2	0.0
65+ yrs	1	1	2	1.0
Total	**15**	**11**	**26**	**1.4**
%	*57.7*	*42.3*	*100.0*	

4.4 Other Vectorborne Diseases

Four vectorborne diseases were added to the notifiable disease list in Ireland from the beginning of 2012. This chapter summarises the information gathered on these notifications in the second year of formal surveillance. The case definitions for these diseases are outlined on the HPSC website at http://www.hpsc.ie/NotifiableDiseases/CaseDefinitions/.

Lyme neuroborreliosis

Lyme neuroborreliosis is an infection caused by a spiral-shaped bacterium called *Borrelia burgdorferi* that is transmitted to humans by bites from ticks, generally hard-bodied ticks (*Ixodidae).*

During 2015, 12 cases of Lyme neuroborreliosis were notified in Ireland, six female and six male. Six patients were admitted to hospital, four were GP patients and one each were reported as a hospital out-patient and a hospital day patient. One case was reported as being acquired abroad, two acquired the infection in Ireland and the remaining nine cases did not report country of infection.

Cases were reported from five of the eight HSE areas. Table 2 displays the regional distribution of cases by age group in years.

Chikungunya fever

One case of chikungunya was notified in Ireland in 2015. Country of infection was reported as the Cook Islands.

West Nile fever

No cases of West Nile fever were notified in Ireland in 2015.

Dengue Fever

During 2015, eight confirmed cases of dengue fever were notified. Four cases were reported as GP patients and one was admitted to hospital. Patient type was not reported for the remaining three cases. Table 2 displays the regional distribution of cases by age group in years.

Dengue is found commonly throughout the tropics and subtropics and is endemic in about 100 countries. Of the eight cases reported in 2015, country of infection was reported for five cases (62.5%). One case each reported country of infection as Brazil, Dominican Republic, Haiti, Sri Lanka and Thailand. The remaining three cases did not have a country of infection specified.

Table 1: Lyme neuroborreliosis notifications by age group (years) and HSE-area, 2015

Age group (years)	HSE-E	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W	Total
5-9 yrs	1								**1**
10-14 yrs		1							**1**
25-34 yrs	1								**1**
35-44 yrs							2	1	**3**
45-54 yrs								1	**1**
55-64 yrs							1	1	**2**
65+ yrs			3						**3**
Total	2	1	3	0	0	0	3	3	12

Table 2: Dengue fever notifications by age group (years) and HSE-area, 2015

Age group (years)	HSE-E	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W	Total
20-24 yrs	1								**1**
25-34 yrs	2			1					**3**
35-44 yrs	2								**2**
45-54 yrs	1		1						**2**
Total	6	0	1	1	0	0	0	0	8

2015

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05

BLOOD-BORNE AND SEXUALLY TRANSMITTED INFECTIONS

5.1 Hepatitis B

Summary

Number of cases, 2015: 549
Crude notification rate, 2015: 12/100,000 population
Number of cases, 2014: 442

Hepatitis B is a vaccine preventable disease caused by the hepatitis B virus. It is transmitted through percutaneous or mucocutaneous contact with the blood or body fluids of an infected person. After acute HBV infection, the risk of developing chronic hepatitis B declines with increasing age.[1] Approximately 90% of infants infected at birth will develop chronic infection, compared to 20-50% of children infected between the ages of one and five years. Only 1-10% of those infected as older children or adults will develop chronic hepatitis B. An estimated 15-25% of those who develop chronic infection with die prematurely of either cirrhosis of the liver or hepatocellular carcinoma.

The prevalence of hepatitis B in the general population in Ireland is low (less than 1%). Most cases fall into defined risk groups such as people with multiple sexual partners, sexual or household contacts of known cases, injecting drug users and people who were born in countries with intermediate (2-7%) or high (>8%) hepatitis B endemicity.

The number of hepatitis B cases reported in Ireland increased by 24% in 2015, with 549 cases (12/100,000 population) notified compared to 442 in 2014. Hepatitis B notifications had been generally decreasing since their highest levels in 2008 (n=899, 21.2/100,000 population), but recent trends indicate that this decline is not continuing. Annual hepatitis B notifications since 1997 are shown in figure 1.

The highest notification rates were in HSE E (21.4/100,000 population, n=346) and HSE NE (15.4/100,000 population, n=68) and the increase in notifications in 2015 was mostly due to higher numbers of cases in these two areas. Geographic trends for the past four years are shown in figure 2.

All cases were laboratory confirmed. Ninety six percent (n=528) of the 549 notifications contained information on acute/chronic status. Of these, 5% (n=26, 0.6/100,000 population) of cases were acutely infected and 95% (n=502, 10.9/100,000 population) were chronically infected. Both acute and chronic cases of hepatitis B are notifiable in Ireland.

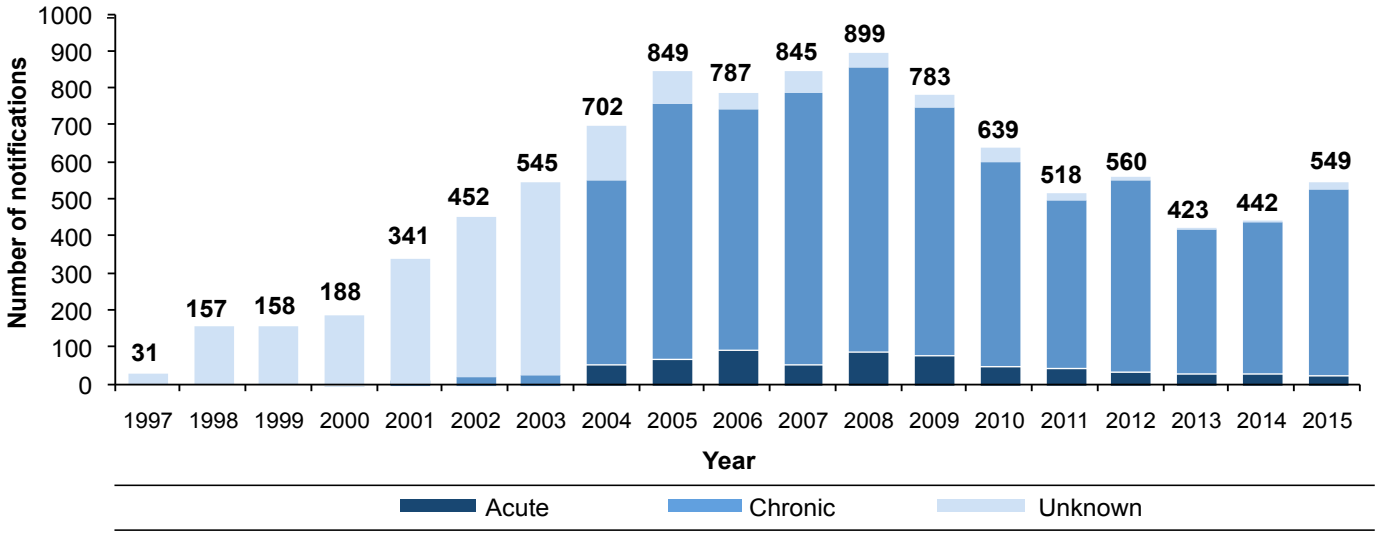

Figure 1. Number of hepatitis B notifications by acute/chronic status, 1997-2015

Acute cases (recent infections)
The number of acute cases of hepatitis B notified in Ireland is relatively low and decreased slightly in 2015 (n=26) compared to 2014 (n=29) (figure 3). This is the lowest number of acute infections reported since acute/chronic case definitions were introduced in 2004.

Eighty five percent (n=22) of acute cases notified in 2015 were male. The age at notification ranged from 21 to 78 years, with a median age of 41.5 years. Notification rates for older age groups were higher than observed in previous years (figures 3 & 4).

Information on risk factor was available for 88% (n=23) of the acute cases notified in 2015. Of these, 74% (n=17) were likely to have been sexually acquired (eight heterosexual, six men who have sex with men and three of unknown sexual orientation). No risk factor was identified for four cases despite public health follow up.

Country of birth was specified for 92% (n=24) of acute cases, 79% (n=19) of whom were born in Ireland. The reason for testing was known for 25 cases and most were tested because they were experiencing symptoms (n=15, 60%) or because they requested STI screening (n=4, 16%).

Chronic cases (long-term infections)
There was a 22% increase in chronic hepatitis B notifications in 2015 (n=502) compared to 2014 (n=411) (figure 5). However, chronic notifications have decreased significantly since peak levels in 2008 (n=769).

Of the 502 chronic cases notified in 2015, 59% (n=297) were male, 40% (n=203) were female and sex was not reported for 2 cases. Seventy eight percent (n=392) of chronic cases were aged between 20 and 44 years when notified and the median age at notification was 34 years (figures 5 & 6).

Although primary risk factor was reported for a minority of chronic cases in 2015, data on country of birth or asylum

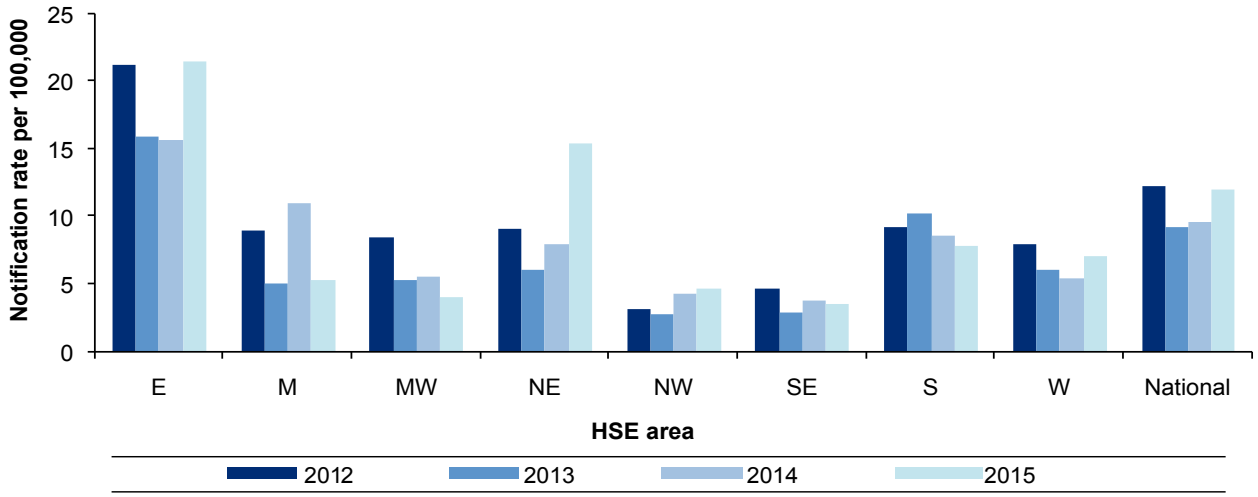

Figure 2. Hepatitis B notification rates/100,000 population, by HSE area, 2012-2015

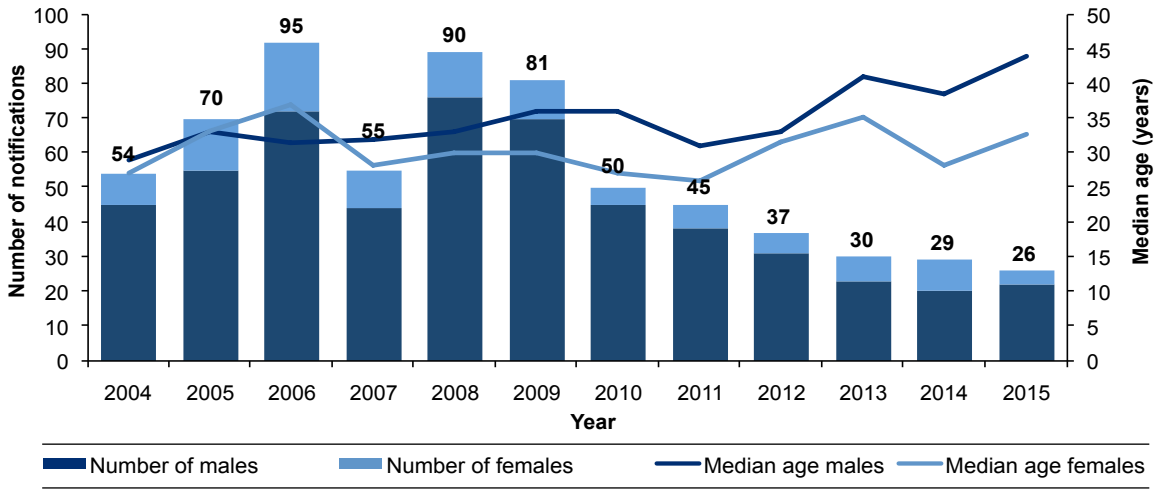

Figure 3. Number of acute cases of hepatitis B notified, by sex and median age, 2004-2015

seeker status was available for 50% (n=251). Of these, 90% (n=225) were either born in a hepatitis B endemic country (hepatitis B surface antigen prevalence >2%) or were asylum seekers. Most of these cases are likely to have been infected outside Ireland, but the actual mode of acquisition of infection is unknown for the majority. Where country of birth was available (45%, n=227), the most common birth countries were in Central or Eastern Europe (38%, n=87), Asia (33%, n=75), Sub-Saharan Africa (19%, n=44) and Western Europe (7%, n=16). Of those born in Western Europe, twelve were born in Ireland.

The reason for testing was known for 60% (n=301) of chronic cases. The main reasons were: antenatal screening (20%, n=59), STI screening (18%, n=54), asylum seeker screening (16%, n=47) and re-testing of known cases (not previously notified) (13%, n=38).

Immigration and hepatitis B notifications

Hepatitis B notifications are likely to be influenced by trends in immigration to Ireland. The large increase in the number of hepatitis B cases between 1997 and 2008 (figure 1) coincided with significant numbers of people migrating to Ireland from hepatitis B endemic countries. The economic downturn, in 2008, lead to a decline in both immigration and hepatitis B notifications. The subsequent economic recovery has resulted in increased immigration in recent years and this is likely to have contributed to the recent increase in hepatitis B notifications. Figure 7 shows trends in hepatitis B notifications alongside immigration trends.[2]

Co-infections

Co-infection with other blood-borne viruses can lead to more severe liver disease and an increased risk of liver cancer in people with hepatitis B infection. Eleven of the cases of hepatitis B notified in 2015 were co-infected with HIV. Three other cases were infected with hepatitis C.

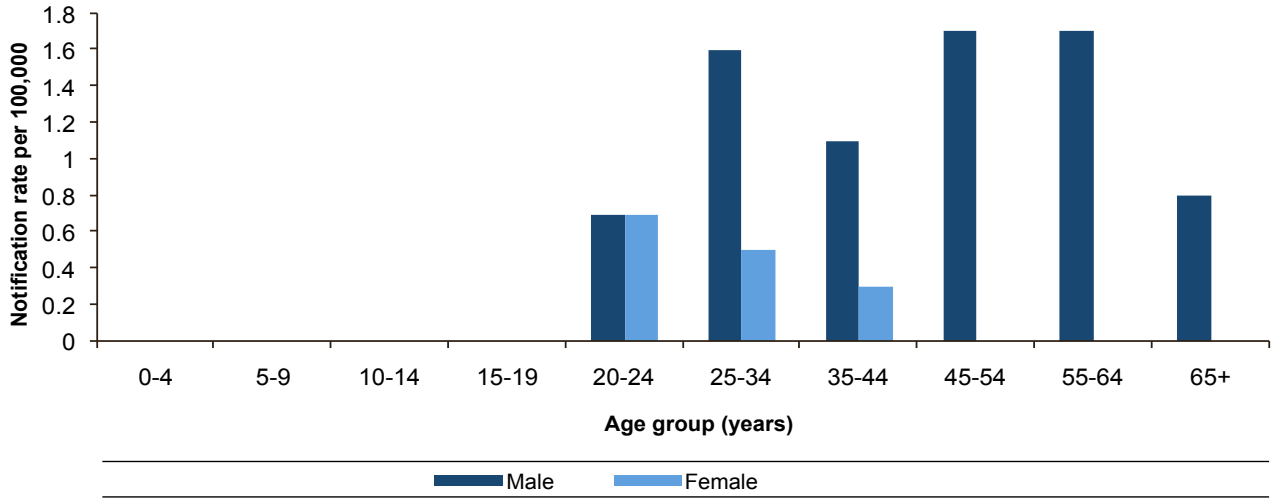

Figure 4. Age and sex-specific notification rates/100,000 population for acute cases of hepatitis B, 2015

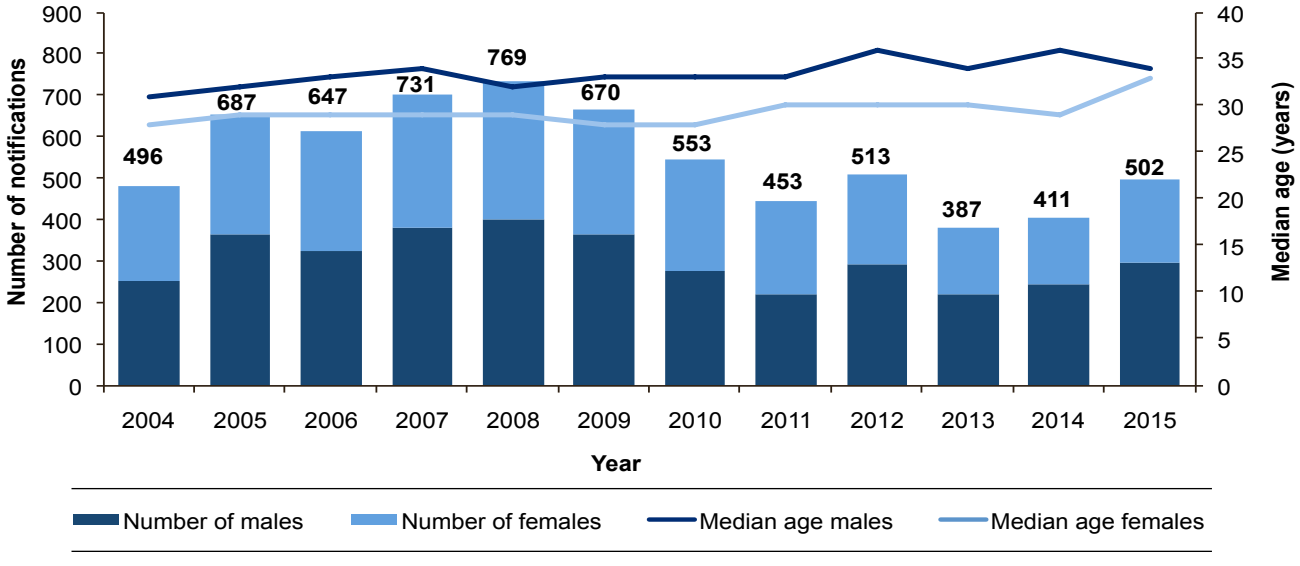

Figure 5. Number of chronic cases of hepatitis B notified, by sex and median age, 2004 to 2015

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) System on 5th September 2016. These figures may differ from those published previously due to ongoing updating of notification data on CIDR.

1. Heyman DL. Control of Communicable Diseases Manual. 19th Edition. Washington: American Public Health Association, 2008.
2. Central Statistics Office (2016) Immigrants (thousand) by country of origin. Accessed 20th September 2016. Available from: http://www.cso.ie/multiquicktables/quickTables.aspx?id=pea18_1

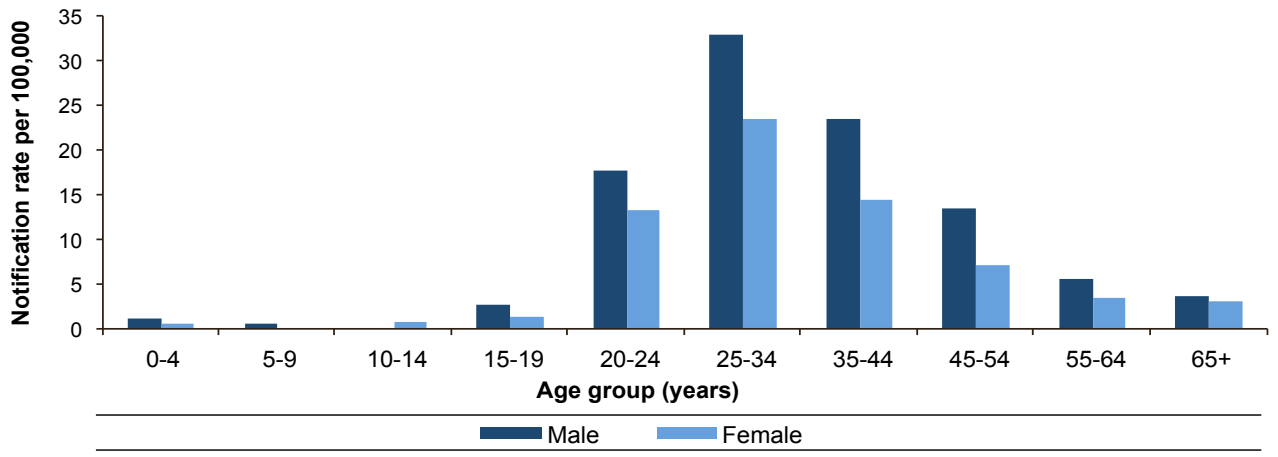

Figure 6. Age and sex-specific notification rates/100,000 population for chronic cases of hepatitis B, 2015

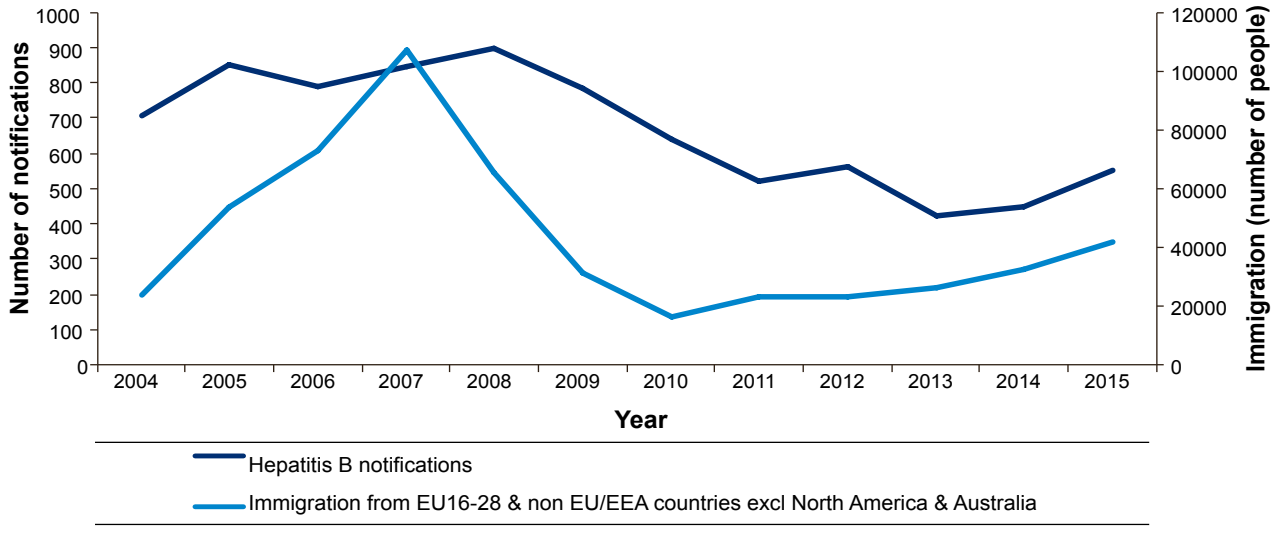

Figure 7. Number of hepatitis B notifications and number of immigrants from EU16-28 & non EU/EEA countries (excluding North America and Australia)

5.2 Hepatitis C

Summary

Number of cases, 2015: 675
Crude notification rate, 2015: 14.7/100,000 population
Number of cases in 2014: 698

Hepatitis C is a major cause of liver disease worldwide. The hepatitis C virus (HCV) is primarily transmitted through sharing contaminated equipment when injecting drugs or through receipt of unscreened blood or blood products (this is no longer a risk in Ireland).[1,2] Sexual, occupational and vertical transmission can also occur but are less common.

Infection is initially asymptomatic in most cases, but approximately 75% of those infected fail to clear the virus and develop chronic infection. Between 5 and 20% of chronically infected individuals develop cirrhosis of the liver after 20 years of infection. Of those with cirrhosis, 1.5% to 2.5% will go on to develop hepatocellular carcinoma (liver cancer) each year.[1] There have been major advances in the treatment of hepatitis C in recent years. The latest generation of direct-acting antivirals (DAAs) can cure more than 90% of patients using all-oral drug regimes, which have fewer side effects than previous treatments.[3]

The overall prevalence of chronic hepatitis C in Ireland is comparable to other Northern European countries, and is estimated to be between 0.5 and 1.2%. Most cases fall into defined risk groups such as people who inject drugs, people who received unscreened blood or blood products in the past and people who were born in hepatitis C endemic countries.[4]

There were 675 notifications of hepatitis C in 2015 (14.7/100,000 population). This is a small decrease compared to 2014 (n=698, 15.2/100,000 population) (figure 1). Notifications have declined by 56% since peak levels in 2007 (n=1,538). However recent trends indicate that levels are stabilizing rather than continuing to decrease.

Notification rates for each HSE area for the past four years are shown in figure 2. Sixty eight percent of notifications in 2015 were from HSE E (n=462, 28.5/100,000 population).

More than two thirds of the cases reported in 2015 were male (68%, n=457), 32% (n=215) were female and sex was not reported for three cases. The highest notification rates were in young to middle aged adults, with 81% (n=546) of cases aged between 25 and 54 years. The median age at notification has gradually increased from 31 years in 2004 to a high of 38.5 years in 2015 (figures 1&3).

Information on most likely risk factor was available for 38% (n=255) of the cases reported in 2015. More than three quarters reported injecting drug use as their most likely mode of infection (76%, n=194). Seven percent (n=17) were likely to have been infected through contaminated blood or blood

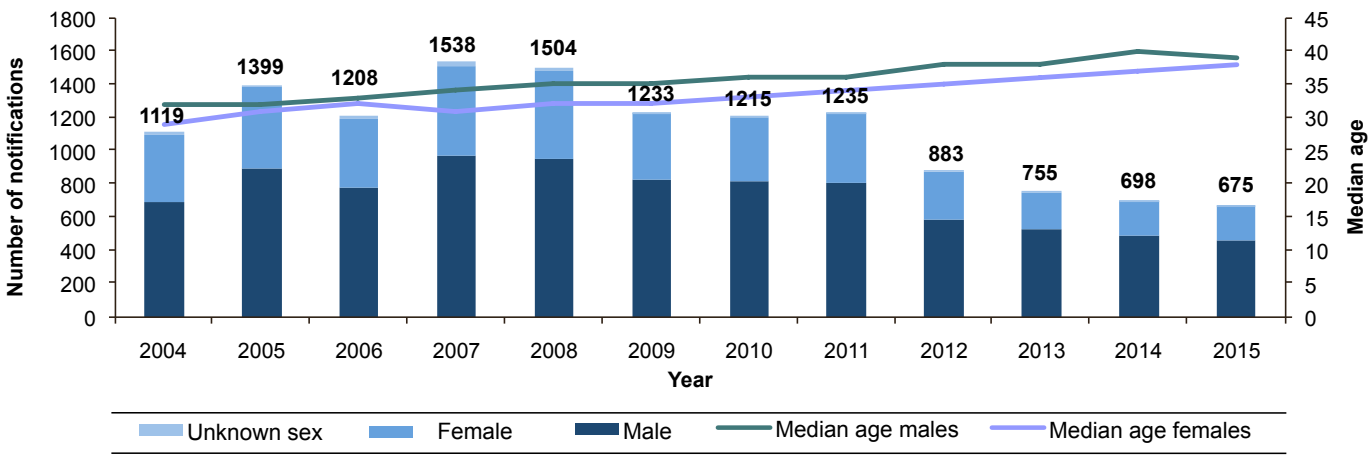

Figure 1. Number of notifications of hepatitis C and median age at notification, by sex, 2004-2015

products, six of whom were infected in Ireland. These Irish infections occurred many years in the past, but were notified for the first time in 2015. A further 5% (n=12) reported sexual exposure (six heterosexual, three men who have sex with men and three unknown sexual orientation) and 4% (n=11) reported tattooing/body piercing as their most likely risk factor. Other risk factors were reported for nine cases and no risk factor was identified for twelve cases despite Public Health follow up. Figure 4 shows recent risk factor trends for hepatitis C in Ireland.

Data on country of birth were available for 33% of cases (n=222) in 2015. Where information was available, 45% (n=99) of cases were born in Ireland, 34% (n=76) were Central or Eastern European, 9% (n=19) were Asian and 5% (n=12) were born in other Western European countries. Just over a third of cases with information on country of birth or asylum seeker status were born in a hepatitis C endemic country (≥2% anti-HCV prevalence) or were asylum seekers. As data on country of birth were not very complete, this may not be representative of all cases. Figure 5 shows most likely risk factor by region of birth for the 222 cases where country of birth was known.

Hepatitis C genotype data were collected retrospectively from NVRL and were available for 50% of notifications in 2015. Of these, 57% (n=192) were genotype 1, 36% (n=120) were genotype 3, 4% (n=12) were genotype 2 and 3% (n=11) were genotype 4. Subtype was available for 94% (n=180) of genotype 1 cases, 71% of which were genotype 1a.

Co-infections can lead to more severe liver disease and an increased risk of liver cancer in those with hepatitis C infection. Nineteen of the hepatitis C cases notified in 2015 were known to be co-infected with HIV. Where risk factor data were available, nine were people who inject drugs and two were men who have sex with men. Four additional cases were coinfected with hepatitis B.

Hepatitis C notifications decreased in recent years. The decline was fairly dramatic in 2012, but this may have been partially attributable to the introduction of new case definitions, specifically excluding cases known to have resolved infection. While notifications continued to decline slightly in 2015, hepatitis C levels now appear to be stabilizing rather than further declining. Trends in hepatitis C notifications are difficult to interpret as infections are often

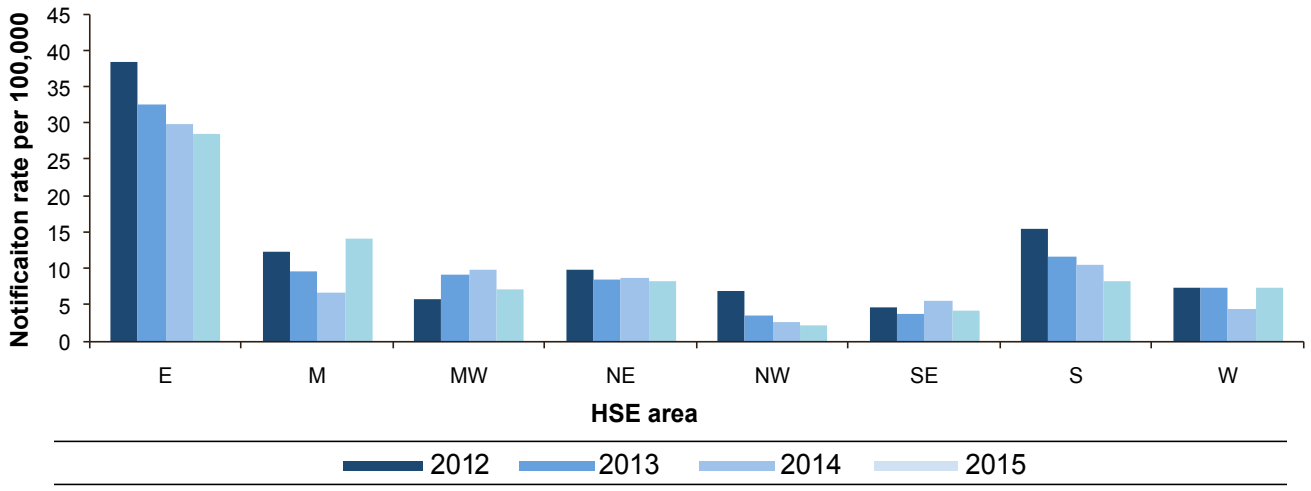

Figure 2. Notification rates/100,000 population for hepatitis C by HSE area, 2012-2015

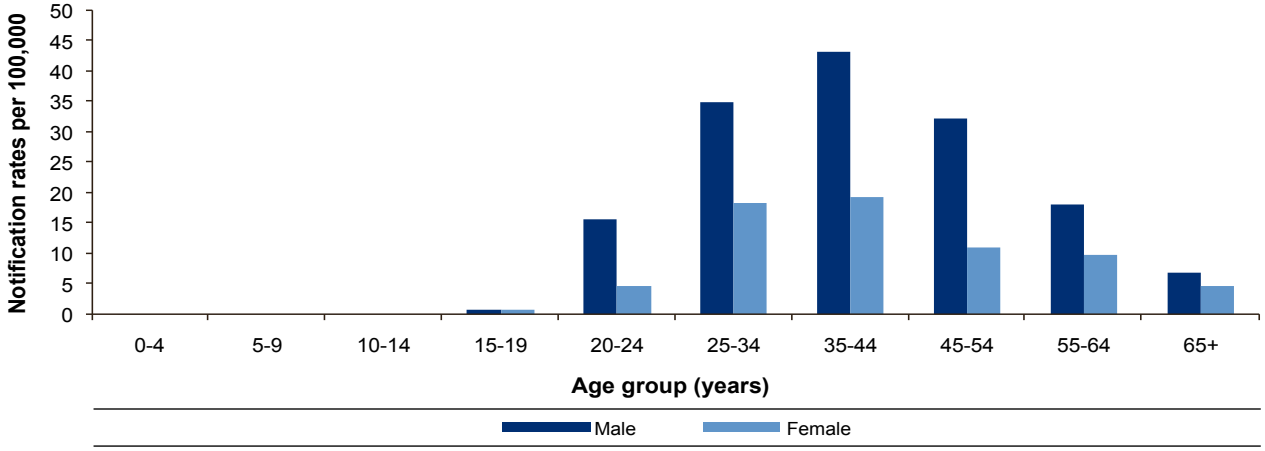

Figure 3. Age and sex-specific notification rates/100,000 population for hepatitis C, 2015

initially asymptomatic and most cases that are diagnosed and notified are identified as a result of screening in key risk groups. Therefore notification trends are highly influenced by testing practices, which may vary over time and may not reflect incidence well.

Risk factor data were available for less than 40% of cases of hepatitis C in 2015. The distribution of risk factors for these cases may differ from cases where data were not available. Where information on risk factor was available, over three quarters of cases were people who inject drugs who were likely to have been infected through unsafe injecting practices. The incompleteness of our risk factor and country of birth data represents a significant gap in our knowledge of the current epidemiology of hepatitis C in Ireland.

The figures presented in this summary are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) System on 26th September 2016. These figures differ from those published previously due to ongoing updating of notification data on CIDR.

1. Global Burden of Hepatitis C Working Group. Global burden of disease (GBD) for hepatitis C.J Clin Pharmacol. 2004 Jan;44(1):20-9.
2. Health Protection Surveillance Centre. National Hepatitis C Database for infection acquired through blood and blood products, 2015 Report. Available from: http://www.hpsc.ie/A-Z/Hepatitis/HepatitisC/HepatitisCDatabase/BaselineandFollow-upReports/File,15238,en.pdf
3. World Health Organization. Guidelines for the screening, care and treatment of persons with chronic hepatitis C infection. Updated version April 2016. Available at: http://apps.who.int/iris/bitstream/10665/205035/1/9789241549615_eng.pdf
4. Thornton L, Murphy N, Jones L, Connell J, Dooley S, Gavin S et al. Determination of the burden of hepatitis C virus infection in Ireland. Epidemiol Infect. 2011 Sep 19:1-8

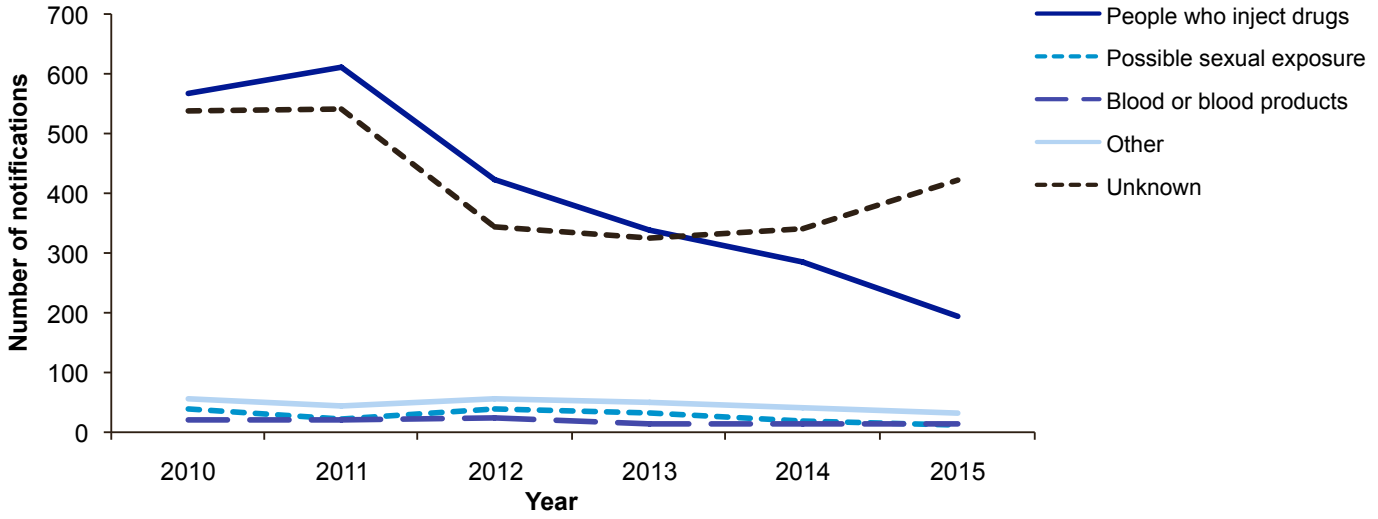

Figure 4. Number of hepatitis C notifications by most likely risk factor (where risk factor known, 54%, n=2956) 2010-2015

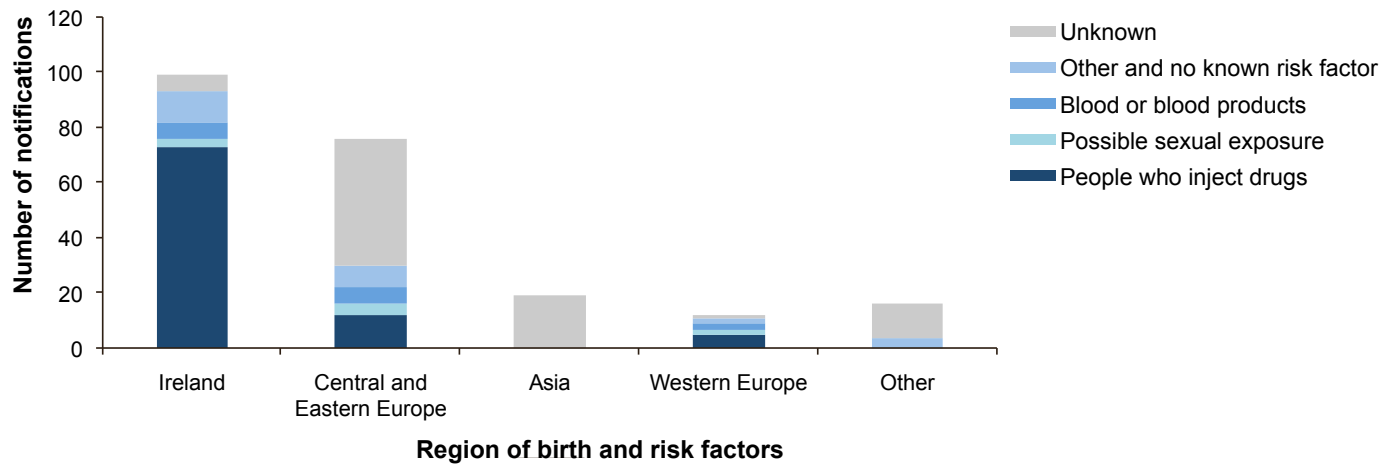

Figure 5. Number of hepatitis C notifications by most likely risk factor and country/region of birth (where country of birth known, 33%, n=222), 2015

5.3 HIV

Summary

Number of notifications: 485
Crude notification rate: 10.6 per 100,000 population

In 2015, 485 people were newly diagnosed with HIV in Ireland, giving a rate of 10.6 per 100,000 population. Between 2010 and 2014, HIV diagnosis rates in Ireland were stable but increased by 30% between 2014 and 2015. This increase was mainly confined to HSE East (where a 38% increase in rate was seen). A number of factors contributed to the increase in HSE East, including an improvement to the national surveillance case definition introduced in January 2015 which resulted in improved sensitivity, timeliness and increased number of notifications[1]; an outbreak of HIV among people who inject drugs (PWID) (1); and an increase in diagnoses among migrant men who have sex with men (MSM).

Among the new diagnoses in 2015, 27% were reported to have previously tested HIV positive abroad, compared to 17% in 2014, and 16% in 2013. The majority of these people (79% in 2015) transferred their HIV care to Ireland.

For a summary of new HIV diagnoses in 2015, refer to Table 1.

Age and gender
In 2015, 76% of HIV diagnoses were in men with 24% among women (male to female ratio**,** 3.2:1). The median age at diagnosis increased from 31 years in 2014 to 34 years in 2015. The rate of diagnosis in 2015 among men was 16 per 100,000 population compared to 5 per 100,000 population among women.

Geographic origin
Of the diagnoses in 2015, 55% were born abroad, 30% were born in Ireland and 15% did not have information on country of birth. Of the cases in migrants, 35% (n=94) were born in sub-Saharan Africa and 33% (n=88) were born in Latin America.

Probable route of transmission
Information on probable route of transmission was available for 89% of diagnoses in 2015. Sex between men remains the predominant mode of HIV transmission reported in Ireland, accounting for 51% (n=247) of diagnoses in 2015. From 2005 to 2015, the number of new diagnoses among MSM increased fourfold (from 60 to 247). There was a notable

1 In January 2015, there was a change to the HIV surveillance case definition for HSE East (Dublin; Kildare; Wicklow). Previously, confirmatory testing by the NVRL was required on two separate samples prior to notification. From January 2015 onwards, confirmatory testing by NVRL on one sample was sufficient prior to notification.

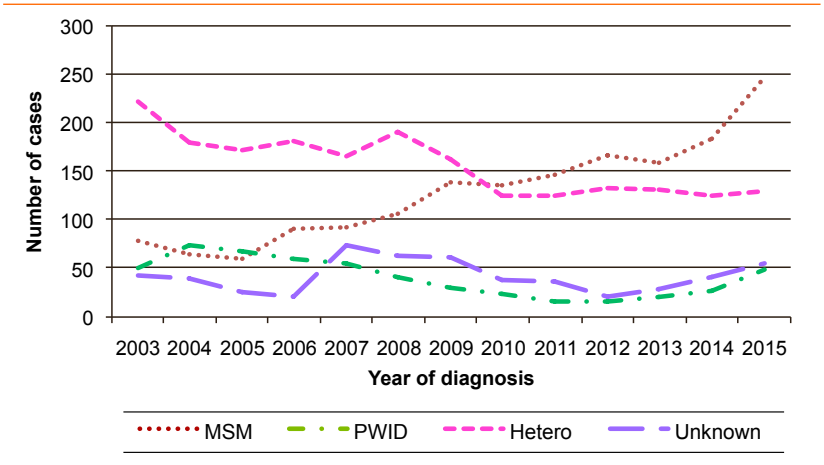

Figure 1: Trends in HIV diagnoses by route of transmission, 2003 to 2015

increase in diagnoses among migrant MSM, from 85 in 2014 to 141 in 2015.

Heterosexual transmission was the second most commonly reported mode of transmission accounting for 27% (n=130) of HIV diagnoses. Since 2010, the number of diagnoses among heterosexuals has remained stable, ranging from 125 to 133 diagnoses per year. The majority of heterosexuals (58%) diagnosed in 2015 were born in countries with generalised HIV epidemics[2].

Ten percent (n=49) of diagnoses in 2015 were attributed to injecting drug use, an increase of 81% compared to 2014 (n=27). This increase was due to an outbreak of recently acquired HIV infection among PWID in Dublin in 2014/2015. Of the new diagnoses, 55% were Irish-born, and 53% were co-infected with hepatitis C. Three quarters of new diagnoses (n=37) were in men.

There were five cases reported where the route of transmission was identified as mother to child transmission (MTCT). None of these cases were born in Ireland and there were no reported MTC transmissions in Ireland in 2015 (*Personal communication: Michelle Goode, Rainbow Clinic*).

Figure 1 shows the trends in new HIV diagnoses by probable route of transmission from 2003 to 2015.

2 A generalised HIV epidemic is where greater than 1% of the general population is HIV positive.

Late diagnosis

Information on stage of diagnosis (CD4 count at diagnosis or AIDS defining illness at diagnosis) was available for 74% of cases in 2015. From the available information, 45% of people newly diagnosed in 2015 were late presenters (with CD4 <350 cells/µl or an AIDS defining illness at diagnosis) including 23% who had advanced HIV infection (with CD4 <200 cells/µl or an AIDS defining illness at diagnosis). Considering the high proportion of people diagnosed with HIV in Ireland who have previously been diagnosed HIV positive abroad, it is important to separate out these groups when looking at late presentation. The proportion of people who presented late was much lower (31%) among those who had a previous HIV diagnosis abroad compared to those who were not reported to have a previous diagnosis abroad (52%).

Discussion

MSM accounted for just over half of diagnoses in 2015. This is also the predominant mode of transmission in EU/EEA countries (42% in 2014) (2). In light of the significant increase in new HIV diagnoses and other STIs among MSM, a national outbreak response group was established in early 2016 to address this evolving situation. This group is developing responses to the situation including: increasing promotion of safer sex messages and promoting regular HIV and STI testing through the man2man.ie programme; increasing testing capacity for MSM in Dublin via a new clinic, being piloted at the Gay Mens Health Service; and employing

Table 1: Characteristics of HIV diagnoses, 2015

Number of HIV diagnoses		485
Rate of diagnoses (per 100,000 population)[1]		10.6
Gender	Males (%)	76.1
	Females (%)	23.9
	Male to female ratio	3.2
Age	Median age of adult cases (years)	34
	Age range of adult cases (years)	18-72
	Young people aged 15-24 years (%)	8.0
	Aged 50 and older (%)	9.3
Route of Transmission	MSM (%)	50.9
	Heterosexual (%)	26.8
	Injecting Drug Use (%)	10.1
	Mother to Child transmission (%)	1.0
	Unknown (%)	11.1
Region of Birth	Born in Ireland (%)	29.9
	Born abroad (%)	55.1
	Unknown (%)	15.1
Previous history of testing	Previously tested positive abroad (%)	26.6
	Transfer of care (of those previously diagnosed positive abroad)	79.1

1 Based on 2011 census

outreach workers on a pilot basis to deliver peer support and interventions among the MSM community, in particular among Latin American MSM.

Diagnoses of PWID increased in 2015 due to the HIV outbreak among homeless PWID in Dublin (1). This outbreak was associated with the injection of snow blow, a new psychoactive substance, the re-use of needles and syringes, and having a sexual partner who was also injecting drugs (3). Prevention and control efforts were targeted to this group and the outbreak was declared over in February 2016. As a result of the outbreak, there was increased testing among PWID and improved surveillance in this group. However, there is a need for ongoing sustained health promotion and harm reduction activities among this very vulnerable group.

In 2015, there was a significant increase in the number of cases notified who had a previous HIV positive diagnosis abroad (27%). Seventy nine percent of these people transferred their HIV care to Ireland. The change in case definition in January 2015 may account for some of this increase as data on these people may not have been captured prior to 2015.

Overall, the proportion of individuals who were diagnosed at a late stage of infection was high. This proportion varied by risk group and was highest among heterosexual males and those from sub-Saharan Africa (after those with a previous diagnosis abroad had been removed from analysis). Continued and sustained emphasis on the benefits of early testing, and ready access to HIV testing are needed to address this issue.

The detailed 2015 annual report and slide set are available at http://www.hpsc.ie/A-Z/HIVSTIs/HIVandAIDS/SurveillanceReports/

Note: Data for this chapter were extracted from CIDR in August, 2016 and were correct at the time of publication.

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1. Glynn R, Giese C, Ennis O, Gibbons Z, O'Donnell K, Hurley C et al. Increase in diagnoses of recently acquired HIV in people who inject drugs. *Epi-Insight* 2015 Jul;16(7)

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Acknowledgements

We would like to sincerely thank all who have contributed to this report including the National Virus Reference Laboratory (NVRL), Microbiology Laboratories, the Departments of Public Health, Consultants in Infectious Disease/GUM and all other clinicians involved. Data on paediatric infections were provided by the Infectious Disease Unit, Our Lady's Hospital for Children (OLHC), Crumlin.

5.4 Voluntary antenatal HIV testing in Ireland: 2015

Key Points

National reported uptake rate: 100.0%*

Number HIV positive cases: 84

Prevalence: 0.13%

Number new HIV positive cases: 9

Prevalence of new HIV positive cases: 0.01%

* Returns not available for approximately 4% of antenatal women in 2015

Background

Eighteen (of nineteen) maternity hospitals and units provided antenatal HIV screening data for 2015 (no antenatal screening data was available from Letterkenny General Hospital). Nine of the eighteen hospitals (50%) were able to provide data on public patients only. Booking data was retrieved from a variety of sources including maternity IT systems (7 hospitals), maternity unit manual data collection (5 hospitals), patient administrations systems (6 hospitals), and laboratory IT systems (5 hospitals).

More information on the system, a copy of the data collection form and the full 2015 report can be found at www.hpsc.ie/A-Z/HIVSTIs/HIVandAIDS/AntenatalHIVTesting

Results

There were 65,909 live births in 2015, with antenatal screening data available for 63,217 women. Eighty four women tested HIV positive in 2015 at their antenatal screen, giving a HIV prevalence rate of 0.13%, slightly lower than the rate in 2014 (0.15%). Nine of the 84 women were newly diagnosed HIV positive (prevalence of 0.01%) while the remaining 75 women were known to be HIV positive. Table 1 describes the data collected from maternity hospitals between 2008 and 2015. The prevalence of HIV infection among pregnant women varied among HSE areas, ranging from 0.02% in HSE West to 0.18% in HSE Dublin Northeast.

Acknowledgements

We would like to sincerely thank staff in the maternity hospital/units for all the effort involved in providing the antenatal screening data. We would also like to acknowledge the help of staff in the department of public health in the Northwest and laboratory staff in Waterford Regional Hospital for collating their regional data.

1 Uptake of HIV antenatal test is calculated as the number of women tested divided by the number of women booked, multiplied by 100

2 Prevalence of HIV infection is calculated as the number of women testing positive divided by the number of women tested, multiplied by 100

Table 1: Results of the antenatal screening programme, 2008 to 2015

	2008	2009	2010	2011	2012	2013	2014	2015
Number of hospitals participating	18/20	19/20	19/20	20/20	18/20	16/20	17/19	18/19
Number of live births (from CSO)	75,173	75,554	75,174	74,650	72225	68,954	67,462	65,909
Number of women booked	66,558	68,378	70,024	68,111	64,803	57,638	63,538	63,217
Number offered test	66,558	68,026	69,615	67,849	64,803	57,638	63,538	63,217
Number tested	66,210	67,694	69,292	67,135	64,781	57,618	63,532	63,214
Uptake of HIV antenatal test (%)[1]	99.5	99.0	99.0	98.6	99.9	99.9	100.0	100.0
Number HIV positive	123	140	118	109	105	83	93	84
Prevalence of HIV (%)[2]	0.19	0.21	0.17	0.16	0.16	0.14	0.15	0.13
Number newly diagnosed HIV positive	34	32	21	17	22	14	11	9
Prevalence of new diagnoses of HIV (%)	0.05	0.05	0.03	0.03	0.03	0.02	0.02	0.01

5.5 Sexually Transmitted Infections (STIs), 2015

Summary

Total number of STIs in 2015: 12,590
Most frequently reported STI in 2015: *Chlamydia trachomatis* infection (n=6,797)

Summary
During 2015, a total of 12,590 cases of sexually transmitted infections (STIs) were reported. The most frequently reported STIs were *Chlamydia trachomatis* infection (n=6,797), ano-genital warts (n=1,843), gonorrhoea (n=1,302) and herpes simplex (n=1,274) (table 1). Compared to 2014, the largest increase was in cases of early infectious syphilis which increased by 31% in 2015 (to 268).

The burden of STIs is greatest among those aged 15-24 years, and among men who have sex with men (MSM). The 15-24 years age group accounted for over 38% of chlamydia, gonorrhoea and herpes simplex (genital) cases. MSM accounted for 55% of gonorrhoea and 87% of syphilis cases, where mode of transmission was known.

In response to increases in STIs among MSM in 2015, a national multidisciplinary group was established to analyse the epidemiological data, and to propose effective communications and interventions to curb the increases.

***Chlamydia trachomatis* infection**
Chlamydia trachomatis infection was the most frequently reported STI with 6,797 notifications in 2015. The crude incidence rate (CIR) increased to 148.1 per 100,000 population, from 145.8/100,000 in 2014. Chlamydia infections were steady in the years from 2011 to 2013, with rates between 139.6/100,000 and 136.4/100,000 (figure 1). More than three-quarters (n=5,084) of chlamydia cases were among those under 30 years, with the largest proportion aged 20-24 years (40%). There were 16 cases of *Chlamydia trachomatis* infection in young infants (aged 2 months or younger) of which three-quarters were reported as conjunctivitis.

Gonorrhoea
In 2015, a total of 1,302 cases of gonorrhoea were reported in Ireland, giving a notification rate of 28.4 per 100,000 population. The overall trend has increased by 200% between 2009 and 2015. In 2015, the notification rate amongst women remained the same as 2014 (9.7/100,000), whereas the rate in males decreased slightly from 47.2/100,000 in 2014 to 46.7/100,000 in 2015. The vast majority of gonorrhoea cases were among men (n=1,081, 83%). Almost a third of cases (28%, n=364) were among people aged between 20 and 24 years old. Mode of transmission was available for 56% of cases (n=727) in 2015. Where data were known, mode of transmission was reported as MSM for 55% of cases (n=401) and heterosexual for 45% of cases (n=324; 107 males and 217 females). While genital infections were the most frequently reported site of infection among cases (males 36%, females 62%), pharyngeal infection was reported among 26% of males and 10% of females.

Ano-genital warts
During 2015, 1,843 cases of ano-genital warts were reported in Ireland giving a crude incidence rate (CIR) of 40.2 per

Table 1: Number, crude incidence rate (CIR) per 100,000 population & median age of STIs, 2015

STI	Number	CIR	Median Age (range)
Chlamydia trachomatis infection	6,797	148.1	25 years (14-72 years)*
Ano-genital warts (AGW)	1,843	40.2	NA
Gonorrhoea	1,302	28.4	27 years (14-75 years)*
Herpes simplex (genital)	1,274	27.8	30 years (4-81 years)
Non-specific urethritis (NSU)	1,028	22.4	NA
Syphilis (early infectious)	268	5.8	33 years (20-65 years)
Trichomoniasis	58	1.3	35 years (20-59 years)
Lymphogranuloma venereum (LGV)	20	0.4	31 years (21-62 years)
Total	**12,590**		-

*Excludes those <14 years; NA: case-based data were not collected

100,000 population, a decrease from 2014 (46.8/100,000) (figure 1). There were more notifications among men (56%) than women (36%). Gender was not provided for 7% of cases, and age group was not provided for 33% of cases. The highest age-specific incidence rate was among those aged 20-24 years (128.2/100,000). The numbers reported here are likely to be an underestimate of the true incidence as data were not reported from every STI clinic. Further details on the completeness of reporting are available in the report *Ano-genital warts in Ireland, 2015*, available on the HPSC website, www.hpsc.ie.

Herpes simplex (genital)

There were 1,274 cases of herpes simplex (genital) notified in Ireland during 2015 corresponding to a CIR of 27.8 per 100,000 population, a small increase from 2014 (26.9/100,000) (figure 1). Most cases were reported as Herpes simplex virus (HSV) type 1 (56%), with 34% reported as HSV type 2. Subtype was not reported for 10% of cases. Almost three-quarters of cases (n=927) were in women, and 86% of cases in women (n=794) were in those aged under 40 years.

Trichomoniasis

During 2015 there were 58 cases of trichomoniasis notified in Ireland corresponding to a CIR of 1.3 per 100,000 population, the lowest rate since 2006. All reported cases were among women, with over one third (n=20) of cases aged between 20 and 29 years. The highest gender- and age-specific rates were among women aged 20-24 years (6.6/100,000) and 25-29 years (5.3/100,000).

Lymphoganuloma venereum (LGV)

There were 20 cases of LGV reported in 2015 giving a CIR of 0.4 per 100,000 population (compared with 35 cases in 2014, five cases in 2013 and four in 2012). The majority of cases were reported in HSE East (n=16), with one case reported in each of HSE Midlands, HSE Midwest, HSE Northeast and HSE Southeast. All but one case were in MSM. The majority of LGV cases were HIV positive (n=14). Seventeen cases had a diagnosis of another STI in 2016. Almost two-thirds (60%) of these cases (n=12) were linked to an outbreak among MSM in the Greater Dublin area. A multidisciplinary outbreak control team (OCT) was convened in October, 2014 to instigate control measures[1].

Non-specific urethritis

At total of 1,028 cases of non-specific urethritis were reported in 2015 compared with 897 cases in 2014.

More detailed annual reports on STIs are available on the HPSC website at http://www.hpsc.ie/A-Z/HIVSTIs/SexuallyTransmittedInfections/Publications/STIReports/STIAnnualReports/.

Weekly reports on STIs and HIV are available on the HPSC website at http://www.hpsc.ie/A-Z/HIVSTIs/SexuallyTransmittedInfections/Publications/STIReports/STIWeeklyReports/.

Data on syphilis, HIV and hepatitis B are presented elsewhere in this report.

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Note: CIDR information is updated on an on-going basis with the most up to date information available and so numbers reflect the date of extraction from CIDR. Data for this chapter were extracted from CIDR in August and September, 2016.

Acknowledgements

The Health Protection Surveillance Centre (HPSC) would like to thank all those who provided data for this report, particularly the STI clinics, and the infectious disease surveillance staff within the departments of public health, the laboratories, and GP clinics.

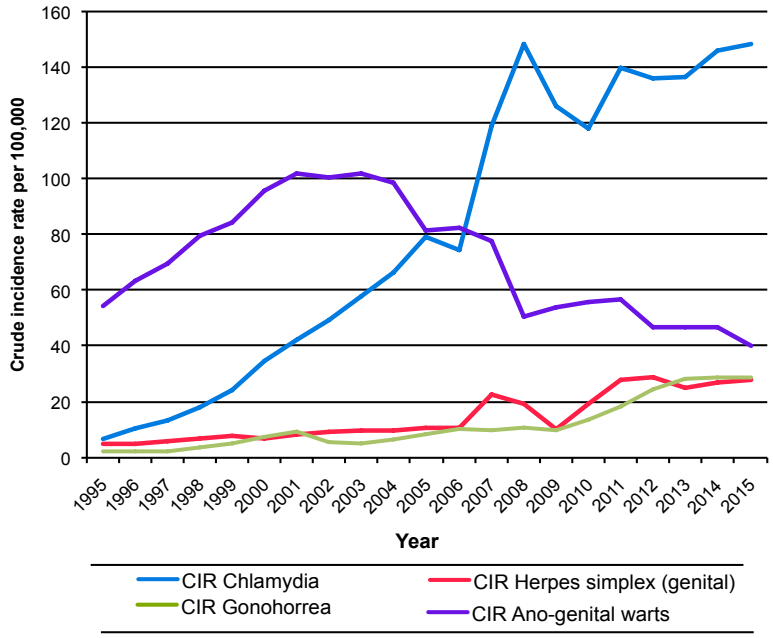

Figure 1 Trend in Crude incidence rate (CIR) per 100,000 population of selected STIs, 1995-2015

5.6 Syphilis, 2015

Summary

Number of early infectious syphilis cases: 268

Crude incidence rate of early infectious syphilis: 5.8/100,000 population

Number of congenital syphilis cases: 0

All laboratories were asked to notify new cases of syphilis, with one of: positive serology (*T. pallidum* EIA and TPPA) **AND** either RPR **OR** *T. pallidum* EIA IgM positive; demonstration of treponemes in lesions, exudates or tissues from clinically appropriate sites by dark ground microscopy; or demonstration of treponemes in lesions, exudates or tissues from clinically appropriate sites by PCR. Re-infections, as defined by the laboratory's own criteria, were also notifiable. This case definition was introduced in January 2014, and remained current for all of 2015.

During 2015, 437 cases of syphilis were notified which met the criteria for laboratory diagnosis of early syphilis. Of these, 268 (61%), where enhanced information was provided by clinicians, were reported as early infectious syphilis. Stage of infection was reported as unknown or enhanced surveillance forms were not received for the remaining 169 cases. No congenital syphilis cases were notified in 2015.

This analysis focuses on cases fitting the laboratory criteria and clinical criteria (n=268) and so the number of early cases in this report is likely to be an under-estimate of the true number of early infectious syphilis cases.

The crude incidence rate for early infectious syphilis in 2014 was of 5.8 per 100,000 population, an increase of 22% compared to 2014 (4.5 per 100,000). Figure 1 shows the trend in crude incidence rate (CIR) for early syphilis cases from 2000 to 2015.

Of the 268 early infectious syphilis cases notified in 2015:

- 135 (50%) were classified as primary syphilis, 60 (23%) as secondary syphilis and 73 (27%) as early latent
- Rates varied throughout the country, with the age-standardised incidence rate (10.6 per 100,000) in HSE East (Dublin, Kildare and Wicklow) 1.8 times the national rate (5.8 per 100,000). There was also a significant increase in HSE South (from 1.1/100,000 to 4.6/100,000) due to an outbreak in Cork among MSM (figure 2).
- The majority of cases occurred in males (n=258; 96%), with a male to female ratio of 26:1.

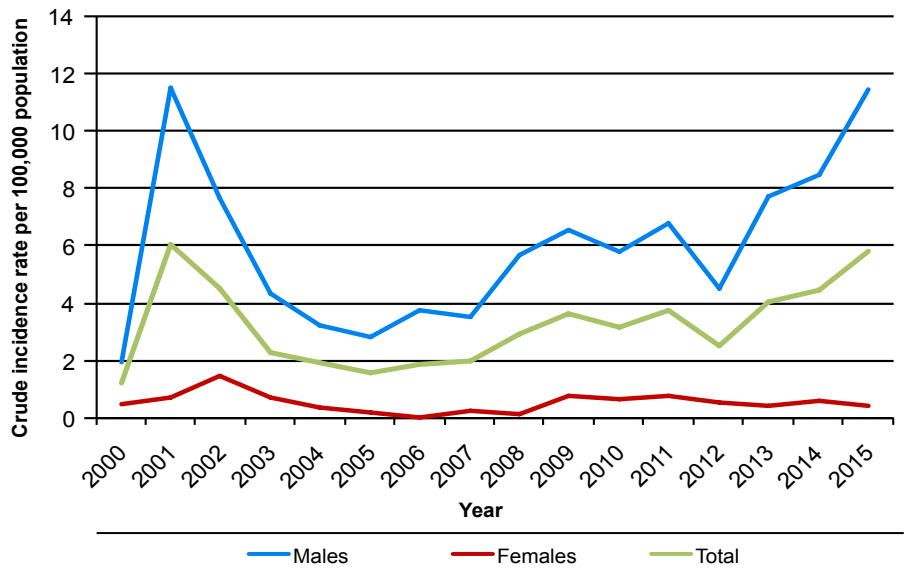

Figure 1: Crude incidence rate of early infectious syphilis (per 100,000 population), 2000-2015

- The crude incidence rates in men and women were 11.4 and 0.4 per 100,000 population respectively (figure 1).
- The majority of cases (85%) were reported in people over 25 years of age.
- Almost three quarters of cases (73%) were identified in STI clinics, with 21% being diagnosed in general practice.
- An increasing proportion of cases (82%) occurred in men who have sex with men (MSM). In MSM, a significant proportion (30%) was co-infected with HIV at the time of syphilis diagnosis.
- Twelve percent of cases were among heterosexuals. Eighteen percent of heterosexuals were co-infected with HIV.
- One of the 10 female cases one was pregnant at time of diagnosis.
- Almost a quarter of early cases (23%) were also diagnosed with an STI other than HIV during 2015. Since full patient identifiers were not provided for all cases, the true figure for STI co-infections is likely to be much higher.

Discussion

2015 was the second year for which only cases of early infectious syphilis were notifiable. The aim of reporting early infectious syphilis was to improve completeness of information and data quality. The proportion of cases for which enhanced surveillance forms were received decreased compared to 2014 (61% vs 73% in 2014 and 60% in 2013). The true number of early infectious syphilis cases may be higher than reported here, as only cases with both laboratory and clinical data indicating early infectious syphilis, were included in the analysis.

In 2015, the crude incidence rate of early syphilis increased to 5.8 per 100,000, the highest rate since the syphilis outbreak among MSM in Dublin in 2001 (6.1/100,000). The increase in early syphilis in 2015 was concentrated among men (96% of cases). The rate among men increased to 11.8 per 100,000 compared to 7.7/100,000 and 8.4/100,000 in 2013 and 2014, respectively. The rate among women decreased slightly in 2015, with a rate of 0.4 per 100,000 compared to 0.6/100,000 and 0.4/100,000 in 2013 and 2014, respectively.

The increase in 2015 was exclusively among MSM. Cases among MSM increased by 57% compared to 2014 (220 versus 140) and by 133% compared to 2012. Cases among heterosexuals decreased in 2015 by 8% (33 versus 36 in 2014) and cases with unknown mode of transmission decreased from 28 in 2014 to 15 cases in 2015. The ASIR in HSE East (10.6/100,000 population) remains significantly higher than the national rate (5.8/100,000 population) with more than 80% of cases in HSE East occurring among MSM, confirming that this area remains a centre of transmission within Ireland.

The proportion of early infectious syphilis cases co-infected with HIV in 2015 increased to 29%, the same proportion as 2013 but an increase on 2014 when 25% were co-infected with HIV. The proportion of HIV co-infection continues to be higher among MSM (30%) compared to heterosexuals (18%). Of those co-infected with HIV, the number diagnosed with HIV in the same year as their syphilis diagnosis rose to 39% in 2015 (compared to 26% in 2014 and 31% in 2013). The proportion of cases co-infected with HIV remains a concern as co-infection increases the risk of acquiring and

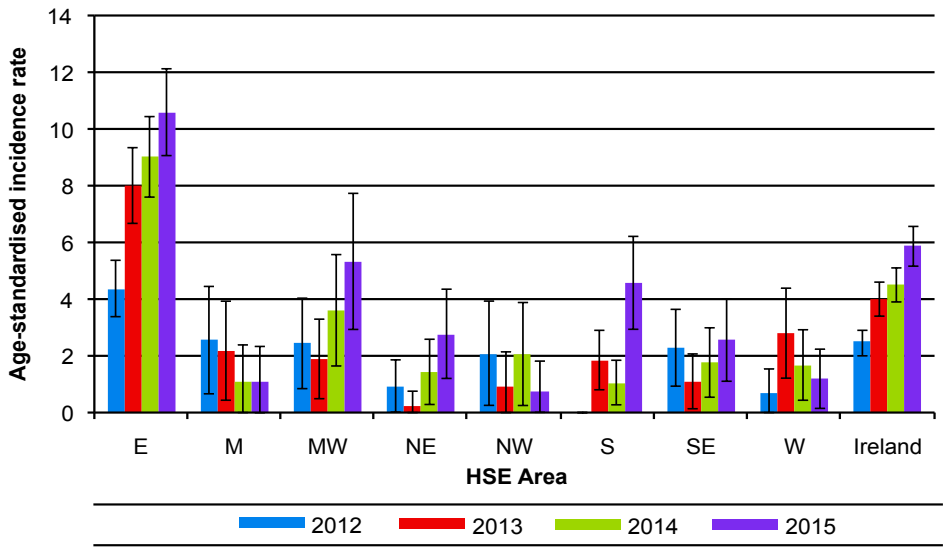

Figure 2: Age-standardised incidence rate of early infectious syphilis by HSE area, 2012-2015

transmitting HIV[1].

Preliminary analysis of 2015 data pointed to a significant increase in early infectious syphilis and other sexually transmitted infections among MSM[2]. This analysis also pointed to a change in the demographics of cases, with an increasing proportion of cases among Latin American MSM living in Ireland (up from 6% in 2012 to 25% in 2015). A growing number of MSM acquired their infection in Ireland in 2015 (74%) compared to previous years (59% in 2014). Similar increased trends in HIV and other STIs were also a cause for concern. Therefore, in response, a national multidisciplinary multi-sectoral group was established. The response involves three main strands of work covering interventions, communications and epidemiology, including ongoing analysis of trends in 2016[2].

A more detailed analysis of syphilis in Ireland in 2015 is available in the report Syphilis in Ireland, 2015, which is available on the HPSC website.

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Note: CIDR information is updated on an on-going basis with the most up-to-date information available and so numbers reflect the date of extraction from CIDR. Data for this chapter were extracted on 19th September, 2016.

Acknowledgements

The Health Protection Surveillance Centre (HPSC) would like to thank all those who provided data for this report, particularly the STI clinics, and the infectious disease surveillance staff within the departments of public health, the laboratories and GPs.

Table 1: Summary of early infectious syphilis cases, 2012, 2013, 2014 and 2015

	2012		2013		2014		2015	
	n	%	n	%	n	%	n	%
Total number of early cases	115		184		204		268	
Male	101	87.8	175	95.1	191	93.6	258	96.3
Men who have sex with men (MSM)	81	70.4	120	65.2	140	68.6	220	82.1
Heterosexuals	24	20.9	22	12.0	36	17.6	33	12.3
Unknown mode of transmission	10	8.7	43	23.4	28	13.7	15	5.6
Median age (years)	33		33		32		33	
Age range (years)	19-68		19-73		19-70		20-65	

2015

ANNUAL EPIDEMIOLOGICAL REPORT

06

OTHER INFECTIONS

6.1 Viral Encephalitis

Summary

Number of cases, 2015: 47
Number of cases, 2014: 68
Number of cases, 2013: 6
Crude incidence rate, 2015: 1.02/100,000

Encephalitis due to viruses not otherwise specified (NOS) are notifiable under the disease category 'viral encephalitis'. Details of viral encephalitis cases caused by other notifiable diseases, if any, are presented in other chapters in this report.

In 2015, 47 cases of viral encephalitis (NOS) (VE) were notified in Ireland (1.02/100,000 population) compared to 68 (1.48/100,000) in the previous year (Figure 1). One contributing factor to the decline in numbers can be attributable to the late notification of 15 cases from 2013 (based on their specimen dates) reported during weeks 4 to 7 in 2014. Another reason for the decline in the reported number of VE cases is the fall in varicella/herpes zoster virus (VZV) cases in 2015 (n=22) compared to 33 in the previous year.

The number of VE cases among males (n=21) and females (n=25) was similar, with one case remaining not attributed to either sex. The median age of cases was 52 years (range three weeks to 94 years); 15 (31.9%) cases occurred in those aged 65 or more years. There were four cases of VE in children under five years of age in 2015 and 10 of the 15 VE cases in those aged >65 years were associated with VZV (Figure 1, Table 1).

Of the 47 VE cases, all but one were laboratory tested positive and case classified as confirmed. All but two had a causative pathogen identified: VZV (n=22; 46.8%), herpes simplex virus (HSV) (n=20; 42.6%), human herpes virus type 6 (HHV 6) (n=2; 4.3%), enterovirus (2.1%) and not specified (n=2; 4.3%) (Figure 2).

Caution is advised regarding the detection of HHV 6 DNA in cerebral spinal fluid (CSF) specimens, especially in those cases aged less than three months as HHV 6 DNA can be chromosomally integrated as it may not be clinically relevant. Both cases of HHV 6-related encephalitis in 2015 however, occurred in patients greater than three months of age.

There were no reported deaths or imported cases associated with VE in 2015.

Table 1. Number, age-specific incidence rates and proportion of viral encephalitis (NOS) cases by age group, Ireland, 2015

Age Group	Causative pathogen								
	herpes simplex virus	varicella / herpes zoster virus	human herpes virus type 6	enterovirus	parechovirus	not specified	Total	ASIR	% Proportion
<1	1	0	0	0	0	1	2	2.76	4.3
1-4	1	1	0	0	0	0	2	0.70	4.3
5-14	0	0	1	0	0	0	1	0.16	2.1
15-24	0	3	0	0	0	0	3	0.52	6.4
25-44	7	2	0	1	0	0	10	0.83	21.3
45-64	7	6	1	0	0	0	14	1.34	29.8
65+	4	10	0	0	0	1	15	2.80	31.9
All ages	20	22	2	1	0	2	47	1.02	100
% total cases	42.6	46.8	4.3	2.1	0.0	4.3	100		

ASIR, age specific incidence rate per 100,000 population of total cases

The figures presented in this report are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 8th August, 2016. These figures may differ from those published previously due to on-going updating of notification data in CIDR.

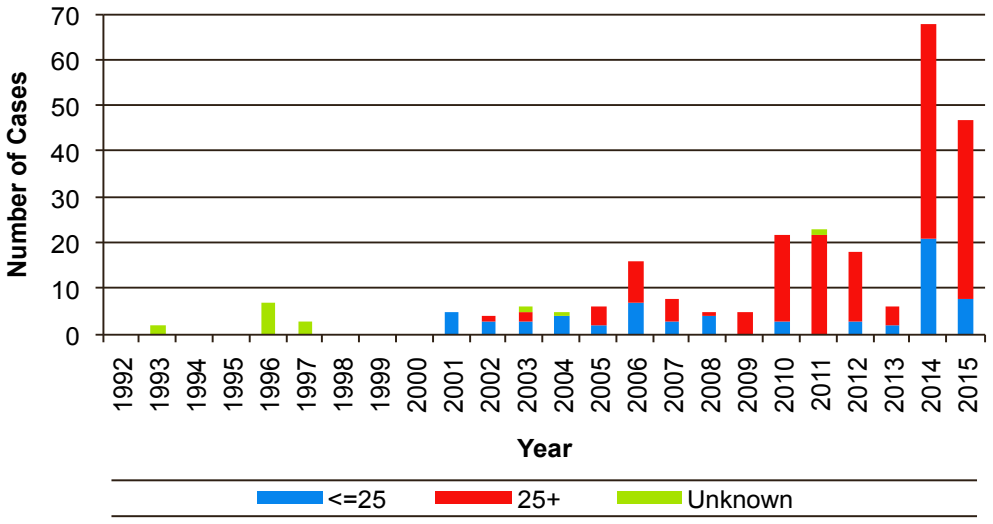

*Figure 1. Number of viral encephalitis (NOS) cases by age group and year, Ireland, 1992-2015**
** includes the late notification of 15 cases in 2013 reported in early 2014*

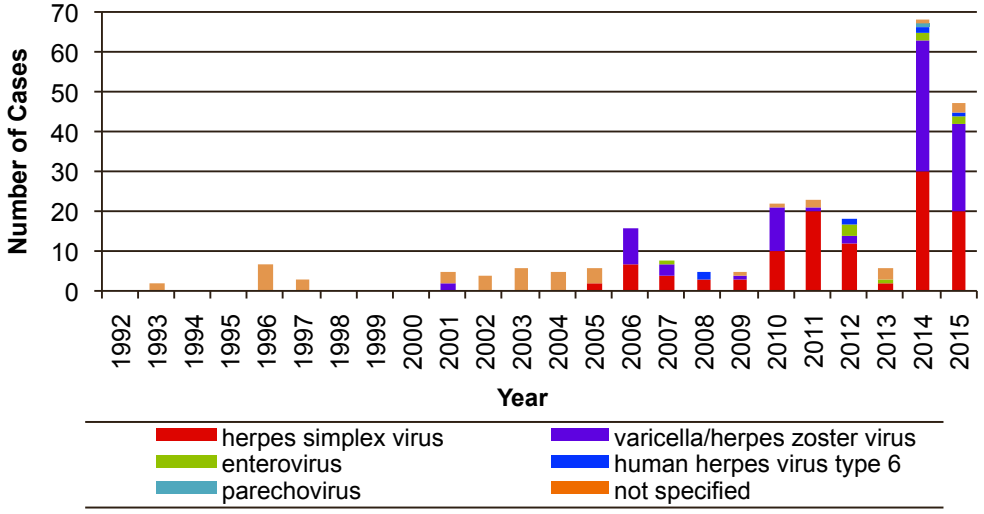

*Figure 2. Number of viral encephalitis (NOS) cases by causative pathogen and year, Ireland, 1992-2015**
** includes the late notification of 15 cases in 2013 reported in early 2014*

6.2 Viral Meningitis

Summary

Number of cases, 2015: 261
Number of cases, 2014: 435
Number of cases, 2013: 281
Crude incidence rate, 2015: 5.7/100,0000

Meningitis due to viruses not otherwise specified (NOS) are notifiable under the disease category 'viral meningitis'. Details of viral meningitis caused by other specified notifiable diseases (such as mumps and influenza viruses, if any) are presented in other chapters in this report.

The steady increase in annual notifications, which started back in 2007 and continued up until 2014, fell sharply in 2015 when 261 were reported (Figure 1). It should be noted that the very high number of cases reported in 2014 include the late notification of seven cases from 2013 (based on their specimen dates) reported during weeks 5 and 6 of 2014.

Since 1997, eight deaths have been reported with cases of viral meningitis (NOS), one of which was attributable to the infection itself. None were reported in 2015.

Of the 261 cases notified in 2015, 251 (96.2%) were classified as confirmed, seven (2.7%) as probable (1.6%) and three (1.1%) as possible. There were slightly more cases among males (n=139) than in females (n=117), giving a male to female ratio of 1.18:1.0. Five cases were reported with unknown gender details in 2015.

The national crude incidence rate in 2015 was 5.7 (95% CI 5.0–8.4) cases per 100,000 population, a 40% decrease compared with the previous year when 435 cases were notified (9.5/100,000). The highest age specific incidence rate (ASIR) in 2015 was in infants <1 year of age (175.4/100,000; n=127), followed by the 25-34 year age group (5.2/100,000; n=39). The lowest ASIR was in the 65+ year age group (ASIR 0.7/100,000 (n=4)) (Table 1).

In 2015 the highest frequency of cases was in children aged 1 to 2 months (n=88) and in those aged between 15 to 39 years (n=83) with an overall median age of one year (range one week to 81 years) (Figure 2). Seventy percent of cases (n=183) occurred in those under 25 years of age (Figure 3, Table 1). One case had no date of birth recorded and therefore had an unknown age.

By HSE region, the highest rate was in HSE E at 7.3/100,000 (95%CI 5.8–8.6) and lowest in HSE S at 3.3/100,000 (95%CI 1.9-4.7), with the latter rate significantly below the national rate (Figure 4).

In 2015, enteroviruses were the most common pathogen associated with viral meningitis, accounting for 78.5% (n=205/261) of all notifications (Figure 3, Table 1). As a cause of viral meningitis, enteroviruses have accounted for 60% or

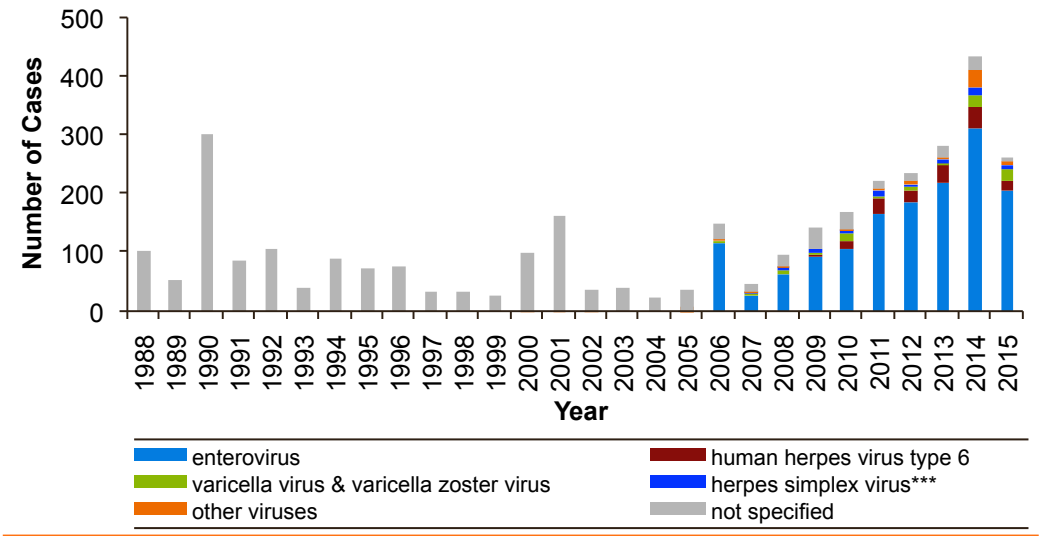

*Figure 1. Number of viral meningitis (NOS) cases by organism type and year, Ireland, 1988-2015**
** includes the late notification of seven cases in 2013 reported in early 2014*

more of all cases each year since 2006. Enteroviruses are not routinely specified on CIDR, so it is not possible to attribute which type of enterovirus, of which there are many, account for the majority of reported viral meningitis cases in recent years. The enterovirus typing service, currently in place in the NVRL, will routinely ascertain which type is circulating in the population in future.

Enterovirus was also the most common pathogen in infants under one year of age with viral meningitis (NOS) in 2015; 106 out of a total of 127 cases in that age group (83.5%) were reported to have this virus. Between 2007 and 2015 enteroviruses accounted for 73.4% (n=1,389/1,884) of all viral meningitis (NOS) cases, with typical summer peaks observed each year (Figure 5). The large number of enterovirus-related viral meningitis cases observed in recent years is likely due in part to improved notification and investigation with laboratory confirmation.

In 2015, varicella/herpes zoster virus (VZV) was the causative pathogen for 7.3% (n=19) notifications, human herpes virus (type 6) (HHV 6) for 6.9% (n=18), parechovirus and herpes simplex virus (HSV) each for 1.9% (n=5), and echovirus type 6 accounting for 1.5% (n=4) of all cases (Figure 3, Table 1). There were 1.5% (n=4) cases with no viral pathogen specified. Caution is recommended regarding the detection of HHV 6 DNA in cerebral spinal fluid (CSF) specimens, especially in those cases aged less than 3 months (n=7/18; 38.9%) as HHV 6 DNA can be chromosomally integrated. When this occurs the HHV 6 DNA can be inherited through the germ line and therefore when it is detected, it may not be clinically relevant.

The figures presented in this report are based on data extracted from the Computerised Infectious Disease Reporting (CIDR) system on 8th August, 2016. These figures may differ from those published previously due to on-going updating of notification data in CIDR.

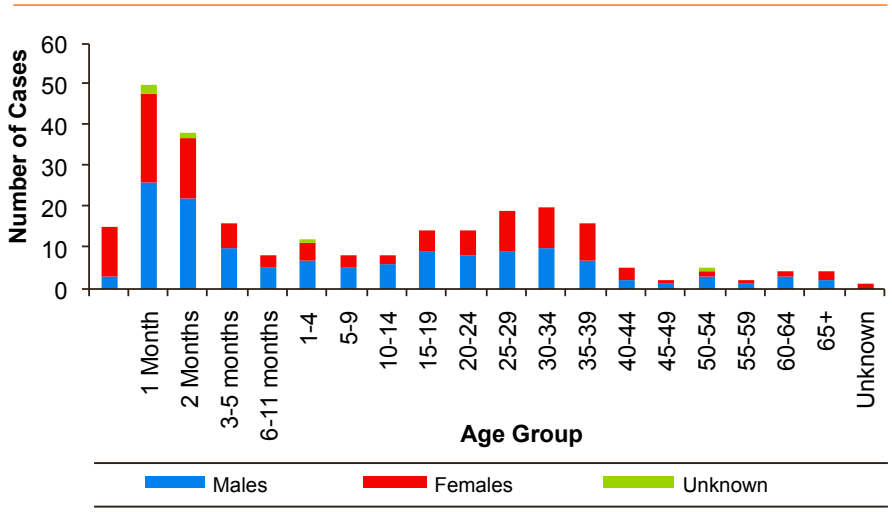

Figure 2. Number of viral meningitis (NOS) cases by age group and sex, Ireland, 2015

Table 1. Number, age-specific incidence rates and proportion of viral meningitis (NOS) notifications by age group and causative pathogen, Ireland, 2015

Age Group	Causative pathogen								
	entero-virus	varicella / herpes zoster virus	human herpes virus	herpes simplex virus type 6	parecho-virus	echo-virus type 6	not specified	Total	ASIR
<1	106	3	13	0	4	0	1	127	175.4
1-4	6	1	3	0	1	0	1	12	4.2
5-9	7	0	0	0	0	1	0	8	2.5
10-14	7	0	1	0	0	0	0	8	2.6
15-19	10	2	0	0	0	1	1	14	4.9
20-24	11	1	0	0	0	1	1	14	4.7
25-34	34	3	0	0	0	1	1	39	5.2
35-44	19	0	0	2	0	0	0	21	3.0
45-54	2	3	1	1	0	0	0	7	1.2
55-64	2	3	0	1	0	0	0	6	1.3
65+	0	3	0	1	0	0	0	4	0.7
All Ages	205	19	18	5	5	4	5	261	5.7
% Total	78.5	7.3	6.9	1.9	1.9	1.5	1.9	100.0	

ASIR, age specific incidence rate per 100,000 population of total cases

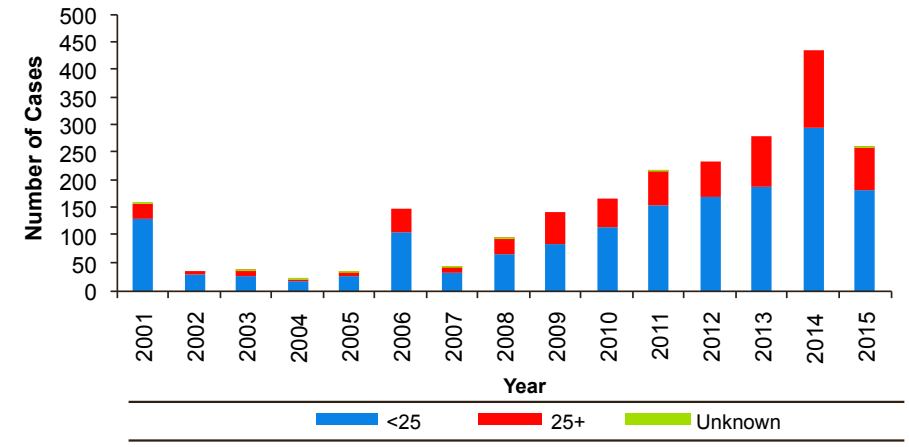

*Figure 3. Number of viral meningitis (NOS) cases by age group (<25, >25 years of age) and year, Ireland, 2001-2015**
** includes the late notification of seven cases in 2013 reported in early 2014*

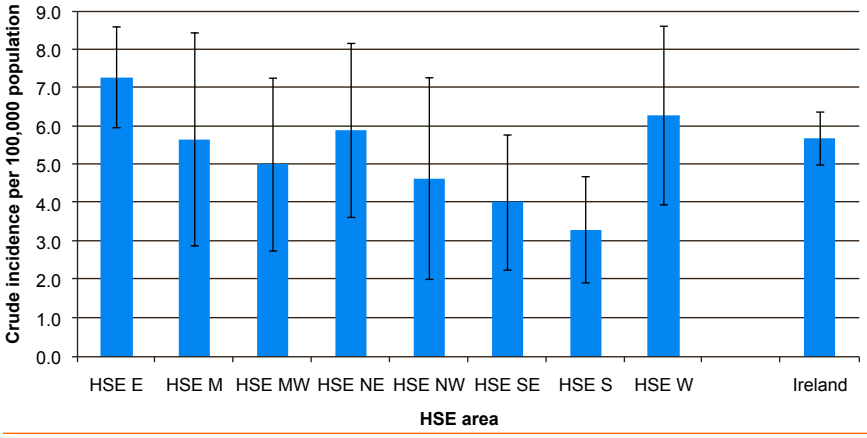

Figure 4. Crude incidence rates per 100,000 population with 95% confidence intervals for viral meningitis (NOS) cases by HSE area, Ireland, 2015

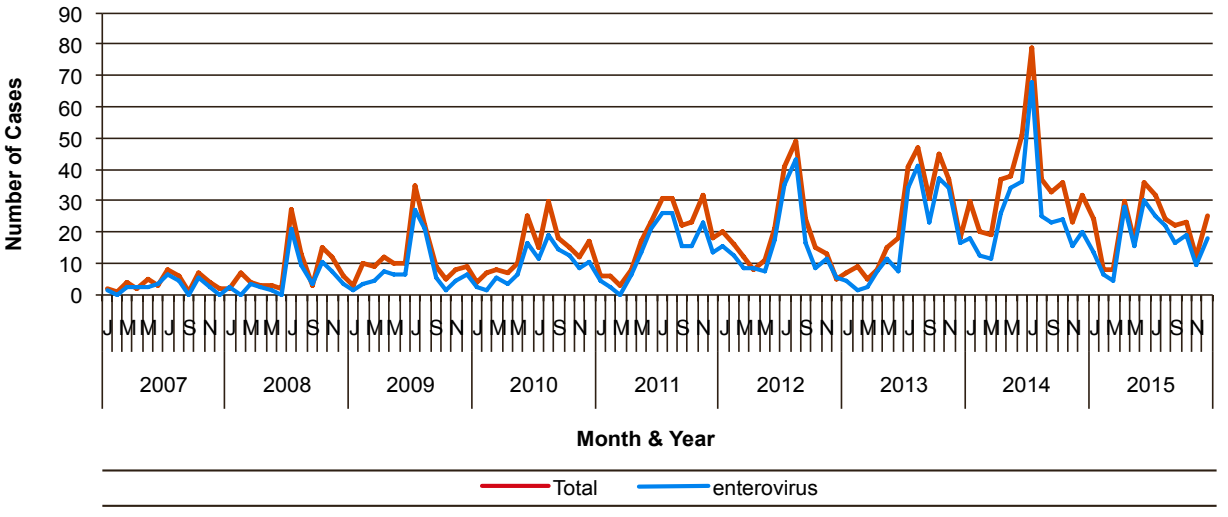

*Figure 5. Monthly number of viral meningitis, NOS and enterovirus-related meningitis notifications, 2007-2015**
** includes the late notification of seven cases in 2013 reported in early 2014*

6.3 Creutzfeldt-Jakob disease

Summary

Number of cases, 2015: 5
Number of cases, 2014: 2

Five cases of Creutzfeldt-Jakob disease (CJD) were notified in 2015 compared to 2014 when two cases were notified. All cases in 2015 were sporadic CJD cases. One of the cases was in the age group 45-54 years, two were in the age group 55-64 years and two were in the age group ≥65 years. Three cases were female and two were male.

In total, 75 cases of CJD were notified since CJD was first specified as a notifiable disease in December 1996 (figure 1). Figure 2 shows the 75 CJD notifications by age group. The majority (80%, n=60) of the cases were aged greater than 54 years. Of the 75 cases, 38 were female and 37 were male. Seventy-one cases were sporadic CJD, two were familial CJD and two were iatrogenic.

Variant CJD (vCJD) is specified as a separate notifiable disease. No cases have been notified since 2006. In total, four cases of vCJD were notified since vCJD became notifiable in December 1996. A summary of these four cases was provided in the 2006 HPSC annual report.

Data presented in this summary are based on notifications from HSE Areas and from the Irish National Creutzfeldt-Jakob Disease Surveillance Unit. Annual figures published here are based on the year the notification was entered on the Computerised Infectious Disease Reporting (CIDR) system and consequently may differ from annual figures published by the Irish National Creutzfeldt-Jakob Disease Surveillance Unit.

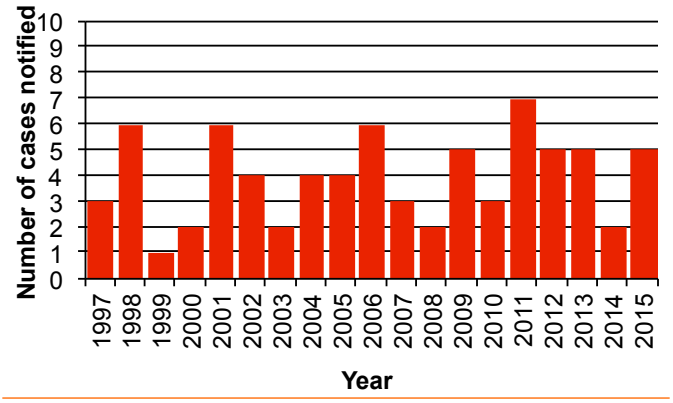

Figure 1. Number of CJD notifications by year from December 1996 to 2015

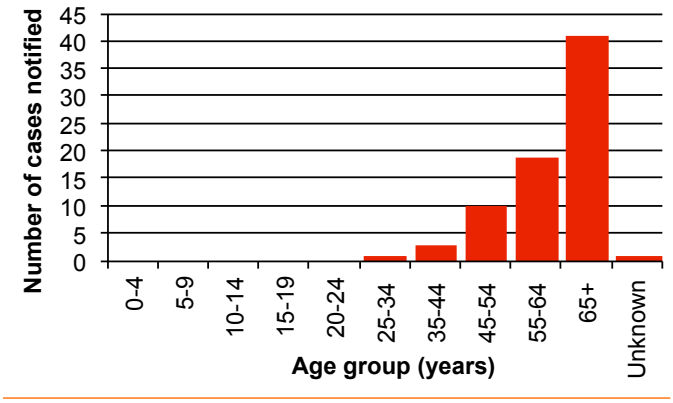

Figure 2. Number of CJD notifications (n=75) from December 1996 to 2015 by age group

2015

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INFECTIOUS DISEASE OUTBREAKS

7. Outbreaks

Summary

Number of outbreaks: 508
Number of IID outbreaks: 315
Number of non-IID outbreaks: 193

During 2015, 508 outbreaks of infectious diseases were reported with 5,578 associated cases of illness, including 242 (4.3%) cases hospitalised and 44 deaths.* Regional variation in outbreaks was observed between HSE areas with the highest rates† observed in HSE-NW (20.9/100,000 population) while the lowest rate was observed in HSE-E at (8.3) and – MW (8.2). Table 1 details the regional distribution of all outbreaks by HSE area and disease.

The number of outbreaks peaked between January and March. The January peak observed was mainly due to high numbers of norovirus and acute infectious gastroenteritis (AIG) outbreaks, February was mainly due to influenza and norovirus, while the March peak was mostly due to influenza and norovirus outbreaks. Figure 1 illustrates the number of IID and non-IID outbreaks by month of notification during 2015.

Similar to previous years, airborne/person-to-person spread was reported as the mode of transmission for the majority of outbreaks (76.4%, n=388). Table 2 details all outbreaks by infectious disease and probable mode of transmission.

The most frequently reported outbreak locations were private houses (n=131, 25.8%), nursing homes (n=112, 22.0%) and community hospital/long-stay units (n=80, 15.7%). The highest numbers ill were reported from outbreaks in nursing homes (n=1,773), community hospital/long-stay units (n=1,165) and hospitals (n=735).

General outbreaks accounted for 72.2% (n= 367) of all outbreaks notified during 2015. The remaining outbreaks (27.8%, n= 141) were reported as family/household outbreaks.

* Outbreak data extracted from CIDR on 16/08/2016.
† All rates are calculated per 100,000 population

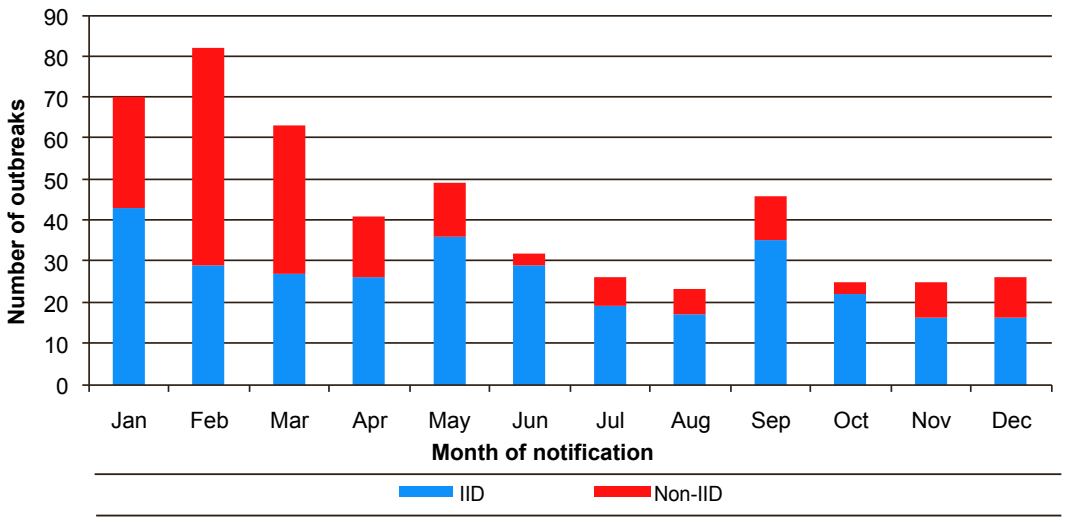

Figure 1: Number of IID and non-IID outbreaks by month of notification, 2015

Table 1 Number of IID and non-IID outbreaks by disease and HSE area, 2015

IID/ Non-IID	Disease	HSE E	HSE-M	HSE-MW	HPSC	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W	Total
IID	Noroviral infection	29	6	3		8	8	14	18	11	**97**
	Verotoxigenic *E. coli* infection	6	16	11	1	14	4	12	15	12	**91**
	Acute infectious gastroenteritis	21	4	2		2	7	10	12	6	**64**
	Cryptosporidiosis	1	3	1			1	4	3	5	**18**
	C. difficile infection	5		1		2				4	**12**
	Salmonellosis	2	1	1		2		1		2	**9**
	Rotavirus infection					2	3			1	**6**
	Campylobacter infection	1	1	1		1				2	**6**
	Giardiasis	1							2	1	**4**
	Hepatitis A (acute)	3	1								**4**
	Shigellosis	1	1							1	**3**
	Typhoid	1									**1**
Non-IID	Influenza	25	5	7		6	15	10	19	6	**93**
	Mumps	15	2	4		3	6	1	5	4	**40**
	Acute respiratory infection	6					6	5	9	2	**28**
	Respiratory syncytial virus infection	3				1	2			1	**7**
	Pertussis	4	1					1			**6**
	Tuberculosis						1		3	1	**5**
	S. pyogenes/ suspected *S. pyogenes*	2				1					**3**
	MRSA	2									**2**
	Aspergillosis	1									**1**
	Hand foot & mouth disease	1									**1**
	Outbreak	1									**1**
	Measles						1				**1**
	Hepatitis B									1	**1**
	Impetigo							1			**1**
	Chickenpox	1									**1**
	Acinetobacter MDR	1									**1**
	Invasive *E. coli*	1									**1**
Total number of outbreaks		**134**	**41**	**31**	**1**	**42**	**54**	**59**	**86**	**60**	**508**
Crude outbreak incidence rate		**8.3**	**14.5**	**8.2**	**n/a**	**9.5**	**20.9**	**11.9**	**12.9**	**13.5**	**11.1**

Table 2: Number of IID and non-IID outbreaks by disease and probable route of transmission, 2015

IID /Non-IID	Disease	PP/ Air-borne	Animal contact	Food-borne	Water-borne	Unknown	Other	Total
IID	Noroviral infection	90				7		**97**
	Verotoxigenic *E. coli* infection	32	10	2	18	28	1	**91**
	Acute infectious gastroenteritis	50		2		12		**64**
	Cryptosporidiosis	7	5	1	3	2		**18**
	C. difficile infection	9				3		**12**
	Salmonellosis	4	1			4		**9**
	Rotavirus infection	6						**6**
	Campylobacter infection	2	2	1		1		**6**
	Giardiasis	1			3			**4**
	Hepatitis A (acute)	3				1		**4**
	Shigellosis	2				1		**3**
	Typhoid					1		**1**
Non-IID	Influenza	90				3		**93**
	Mumps	38				2		**40**
	Acute respiratory infection	26				1	1	**28**
	Respiratory syncytial virus infection	6				1		**7**
	Pertussis	6						**6**
	Tuberculosis	5						**5**
	S. pyogenes/ suspected *S. pyogenes*	3						**3**
	MRSA	2						**2**
	Aspergillosis	1						**1**
	Hand Foot and Mouth Disease	1						**1**
	Outbreak						1	**1**
	Measles	1						**1**
	Hepatitis B	1						**1**
	Impetigo	1						**1**
	Chickenpox - hospitalised cases	1						**1**
	Acinetobacter MDR					1		**1**
	Invasive *E. coli*					1		**1**
Total		**388**	**18**	**6**	**24**	**69**	**3**	**508**

Infectious intestinal disease (IID) outbreaks:
During 2015, 315 IID outbreaks were reported, accounting for 62.0% of all outbreaks. This was an increase of 7% compared to the number reported during 2014 (n=294). After norovirus, the next most commonly reported IID outbreaks were verotoxigenic *E. coli* infection (VTEC) and AIG. Table 3 details the total number ill by disease and the median number ill per outbreak.

Non-infectious intestinal disease (Non-IID) outbreaks:
During 2015, 193 non-IID outbreaks were reported, accounting for 38.0% of all outbreaks. This represents a decrease of 4.7% compared to the number reported during 2014 (n=141). After influenza, the next most commonly reported non-IID outbreaks were mumps and acute respiratory infection.

Table 3: Outbreak disease by total number ill and median[‡] number ill, 2015

IID/Non-IID	Disease	Total number ill	Median number ill per outbreak
IID	Noroviral infection	1887	16
	Acute infectious gastroenteritis	779	8
	Verotoxigenic *E. coli* infection	227	2
	Cryptosporidiosis	53	2
	C. difficile infection	42	3
	Shigellosis	36	2
	Rotavirus infection	25	2
	Salmonellosis	22	2
	Campylobacter infection	15	2
Non-IID	Influenza	1569	10
	Mumps	372	4
	Acute respiratory infection	369	10
	Respiratory syncytial virus infection	72	10
	Tuberculosis	18	3
	Pertussis	14	2

[‡] Median values shown for diseases with more than five outbreaks.

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IMMUNISATION UPTAKE

8.1 Immunisation uptake at 12 and 24 months of age

Summary

Among children at 12 months of age in 2015 uptake of: D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_2$ and PCV_2 was 91%

Among children at 24 months of age in 2015 uptake of: D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$ reached the target of 95%
MMR_1 was 93%
PCV_3 was 92%
Hib_b was 91%
$MenC_3$ was 88%

Introduction

In 2015, the HSE Areas provided HPSC with quarterly immunisation uptake data for their Area and for each of the Local Health Offices (LHOs) in their Area. HPSC collated these data and quarterly reports were produced which are available on the HPSC website. The annual immunisation uptake rates presented here represent the collation of the 2015 quarterly data. The proportion of children who completed the recommended primary childhood immunisation schedule by 12 months (born between 01/01/2014 and 31/12/2014) and 24 months (born between 01/01/2013 and 31/12/2013) of age in 2015 are reported.

Children who were 12 and 24 months of age in 2015 were recommended one dose of vaccine against tuberculosis (BCG vaccine) at birth or by one month of age; three doses of vaccines against diphtheria (D_3), tetanus (T_3), pertussis (P_3), *Haemophilus influenzae* type b (Hib_3), polio ($Polio_3$) and Hepatitis B ($HepB_3$) with one dose of each recommended at two, four and six months of age; three doses of pneumococcal conjugate vaccine (PCV_3) recommended at two, six and 12 months of age and three doses of meningococcal group C ($MenC_3$) vaccine recommended at four, six and 13 months of age (table 1). Also at 12 months of age a dose of MMR (MMR_1) was recommended and at 13 months a dose of Hib (Hib_b) was recommended (table 1). A new primary childhood immunisation schedule was introduced in 2015 for babies born on or after July 1st 2015. Further vaccinations are recommended for older children and adults. Please see the HSE-National Immunisation Office website at http://www.immunisation.ie for current and detailed information on the Irish primary childhood immunisation schedule and also recommended vaccinations for older children and adults.

In children at 12 months of age in 2015 (born between 01/01/2014 and 31/12/2014) uptake of BCG, D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$ and two doses of PCV (PCV_2) and MenC ($MenC_2$) were measured. In children at 24 months of age in

Table 1. Primary childhood immunisation schedule for children born between 01/07/2008 and 30/06/2015

Age	Vaccines
Birth	BCG
2 months	DTaP/Hib/IPV/HepB (6 in 1) + PCV
4 months	DTaP/Hib/IPV/HepB (6 in 1) + MenC
6 months	DTaP/Hib/IPV/HepB (6 in 1) + PCV + MenC
12 months	MMR + PCV
13 months	MenC + Hib

Please note the primary immunisation schedule changed in 2015 for children born on or after 01/07/2015. Please see the HSE-National Immunisation Office website at http://www.immunisation.ie for current and detailed information on the Irish primary childhood immunisation schedule and also recommended vaccinations for older children and adults

BCG	Bacille Calmette Guerin vaccine
DTaP	Diphtheria, Tetanus and acellular Pertussis vaccine
HepB	Hepatitis B vaccine
Hib	Haemophilus influenzae type b vaccine
IPV	Inactivated Polio Virus vaccine
MenC	Meningococcal group C vaccine
MMR	Measles, Mumps and Rubella vaccine
PCV	Pneumococcal Conjugate Vaccine

2015 (born between 01/01/2013 and 31/12/2013) uptake of D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_3$, PCV_3, MMR_1, Hib_b, one dose of vaccine against meningococcal group C ($MenC_b$) on or after twelve months of age and one dose of vaccine against pneumococcal conjugate vaccine (PCV_b) on or after twelve months of age were measured.

The immunisation uptake rates are reported here by HSE Area and LHO. The uptake rates presented here were rounded to zero decimal place. While there are 32 LHOs the immunisation uptake rates for the LHOs of North Lee and South Lee are reported as a combined figure.

Caveats to data

BCG uptake data at 12 months of age has been incomplete since BCG reporting to HPSC began in Quarter 3 2003. This has occurred due to differences in implementation of a neonatal BCG programme across the HSE Areas as well as difficulties in providing these data to the HPSC where the programme was implemented. Prior to the establishment of the HSE each former health board determined their own BCG vaccination policy and some health boards (Western and parts of the Southern Health Board) stopped routine neonatal BCG vaccination but provided BCG vaccination for adolescents or high risk groups. The neonatal programme has now been routinely implemented for all neonates in most, but not all, HSE Areas. Additionally more complete data on neonatal BCG vaccination is now available. However, in the HSE NE, where a neonatal programme is implemented, data is not currently available for reporting. In the HSE W the neonatal programme is not routinely or comprehensively implemented in all LHOs. Therefore, data provided for the HSE W reflects BCG vaccination data for just a small proportion of all babies born in this Area. Galway and Roscommon BCG LHO data became available for reporting for the first time in Quarter 4 2014. Mayo LHO BCG data was not available for reporting purposes prior to 2015. The numbers vaccinated with BCG in Mayo were not included in the HSE W BCG figures prior to 2015. National data for 2015 are presented in this report and compared to 2014 data. The available national BCG cohort data may be around 90% of the national birth cohort in 2015 and 89% in 2014 (these figures are estimates only).

As uptake of $MenC_3$ was low since Q3 2010 and as those over 12 months and less than 12 years of age need only one dose of MenC and those aged 12-23 months need only one dose of PCV, data on $MenC_b$ (one dose of MenC on or after first birthday and before second birthday) and PCV_b (one dose of PCV on or after first birthday and before second birthday) were requested in 2012 for the first time. The $MenC_b$ and PCV_b data were available for only six of the eight HSE Areas from Quarter 1 2012 to Quarter 4 2014 and for seven HSE Areas since Quarter 1 2015. The available national cohort data may be around 91% of the national birth cohort in 2015 and 81% in 2014 (these figures are estimates only).

Immunisation uptake rates at 12 months

Ninety-one per cent of children, at 12 months of age in 2015, received D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_2$ and PCV_2 (table 2). Compared with 2014, the uptake rates for these vaccines decreased by one per cent in 2015.

The available 2015 BCG cohort data may be around 90% (estimate only) of the national birth cohort; based on these data BCG uptake was 86% (table 2). In 2014, BCG cohort data may be around 89% (estimate only) of the national birth cohort; based on these data BCG uptake in 2014 was 87%.

Among the HSE Areas, uptake rates for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$ ranged from 90% to 95% and $MenC_2$ and PCV_2 ranged from 87% to 95% (table 2). The target uptake of ≥95% was reached in the HSE M and HSE W for D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_2$ and PCV_2 (table 2). The target uptake of ≥95% was reached in the HSE M and HSE SE for BCG (table 2).

Among the LHOs, uptake rates for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$ ranged from 86% to 97% and $MenC_2$ and PCV_2 ranged from 83% to 97% (table 2). The target uptake of ≥95% was reached in Longford/Westmeath, Galway, Mayo and Roscommon for D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_2$ and PCV_2 and in Sligo/Leitrim for D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$ and PCV_2 with the highest uptake (97%) of these vaccines in Roscommon (table 2). The target uptake of ≥95% was reached for BCG in six LHOs reporting data (table 2).

Immunisation uptake rates at 24 months

National annual immunisation uptake rates, in children at 24 months of age in 2015, were 95% for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$, 93% for MMR_1, 92% for PCV_3, 91% for Hib_b and 88% for $MenC_3$ (table 3). This is the fifth year national annual uptake rates reached the target of ≥95% for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$. Compared with 2014, the uptake rates for D_3, T_3, P_3, Hib_3, $Polio_3$ and Hib_b decreased by one percent while $HepB_3$, $MenC_3$, PCV_3 and MMR_1 were unchanged (figure 1).

Seven of the eight HSE Areas were able to provide uptake data on $MenC_b$ (one dose of MenC on or after first birthday and before second birthday) and PCV_b (one dose of PCV on or after first birthday and before second birthday) in 2015. The available data may be around 91% (estimate only) of the national birth cohort. Where data were available, national uptake was 90% for $MenC_b$ and 93% for PCV_b at 24 months of age (table 3).

Among the HSE Areas uptake rates for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$ ranged from 94% to 98%, MMR_1 ranged from 91% to 96%, PCV_3 ranged from 90% to 97%, Hib_b ranged from 88% to 97% and $MenC_3$ ranged from 86% to 94% (table 3). Among the seven Areas in a position to provide data PCV_b uptake ranged from 92% to 96% and $MenC_b$ uptake ranged from 88% to 93% (table 3).

The target uptake of ≥95% was reached in six HSE Areas during 2015 for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$, in two HSE Areas for Hib_b and MMR_1, in one for PCV_3 and PCV_b and in none for $MenC_3$ and $MenC_b$ (table 3).

Table 2. Immunisation uptake (%) at 12 months of age in 2015 (cohort born 01/01/2014-31/12/2014) by LHO and HSE Area

HSE Area	Local Health Office/ HSE Area	Number in cohort for BCG	Number in cohort for D_3, T_3 & P_3 *	Immunisation Uptake (%)					
				BCG	D_3	Hib_3	$HepB_3$	$MenC_2$	PCV_2
HSE E	Dublin South	1684	1684	86	91	91	91	90	92
	Dublin South East	1748	1748	86	93	93	93	92	93
	Dublin South City	1732	1732	93	92	92	92	91	92
	Dublin South West	2504	2504	97	92	92	92	91	92
	Dublin West	2678	2678	86	90	90	90	90	90
	Dublin North West	3649	3649	92	89	89	89	89	89
	Dublin North Central	1916	1916	91	86	86	86	86	86
	Dublin North	4084	4084	92	88	88	88	88	88
	Kildare/West Wicklow	3821	3821	94	91	91	91	91	91
	Wicklow	1753	1753	92	91	91	91	90	91
	HSE E Total	**25569**	**25569**	**91**	**90**	**90**	**90**	**90**	**90**
HSE M	Laois/Offaly	2550	2550	95	94	94	94	94	94
	Longford/Westmeath	1959	1959	94	95	95	95	95	95
	HSE M Total	**4509**	**4509**	**95**	**95**	**95**	**95**	**95**	**95**
HSE MW	Clare	1475	1472	93	93	93	93	92	93
	Limerick	1689	1892	96	88	88	88	88	88
	Tipperary NR/East Limerick	1807	1762	93	92	92	92	92	92
	HSE MW Total	**4971**	**5126**	**94**	**91**	**91**	**91**	**91**	**91**
HSE NE	Cavan/Monaghan	na	1876	na	93	93	93	94	94
	Louth	na	1810	na	91	91	91	91	92
	Meath	na	3169	na	91	91	91	91	91
	HSE NE Total	**na**	**6855**	**na**	**91**	**91**	**91**	**92**	**92**
HSE NW	Donegal	1964	1964	94	92	92	91	91	92
	Sligo/Leitrim	1272	1272	95	96	95	95	94	96
	HSE NW Total	**3236**	**3236**	**94**	**94**	**94**	**93**	**92**	**94**
HSE SE	Carlow/Kilkenny	1991	1991	95	90	90	90	89	89
	South Tipperary	1228	1228	97	94	94	94	93	94
	Waterford	1807	1807	94	92	92	92	91	91
	Wexford	2098	2098	94	93	93	93	92	93
	HSE SE Total	**7124**	**7124**	**95**	**92**	**92**	**92**	**91**	**91**
HSE S	North Cork	1349	1327	92	89	89	89	87	87
	North South Lee	5720	5647	92	90	90	90	87	87
	West Cork	681	674	91	87	87	87	83	83
	Kerry	1788	1772	90	91	91	91	87	87
	HSE S Total	**9538**	**9420**	**92**	**90**	**90**	**90**	**87**	**87**
HSE W	Galway	3588	3588	10	95	95	95	95	95
	Mayo	1642	1642	68	95	95	95	95	95
	Roscommon	855	855	53	97	97	97	97	97
	HSE W Total	**6085**	**6085**	**32**	**95**	**95**	**95**	**95**	**95**
Ireland		**61032**	**67924**	**86**	**91**	**91**	**91**	**91**	**91**

na=not available

* As the denominator/number in cohort varied slightly according to vaccine the D_3, T_3 and P_3 cohorts are shown here

Since T_3, P_3 and $Polio_3$ uptake identical to D_3 uptake only D_3 uptake figures are presented

Please note while North Lee and South Lee are two separate Local Health Offices their combined immunisation uptake data are reported here

Table 3. Immunisation uptake (%) at 24 months of age in 2015 (cohort born 01/01/2013-31/12/2013) by LHO and HSE Area

HSE Area	Local Health Office/HSE Area	Number in cohort for D_3, T_3 & P_3 *	Immunisation Uptake (%)									
			D_3	P_3	Hib_3	Hib_b	$HepB_3$	$MenC_3$	$MenC_b$	PCV_3	PCV_b	MMR_1
HSE E	Dublin South	1731	95	95	95	92	95	90	92	93	94	94
	Dublin South East	1635	95	95	95	90	95	88	90	91	93	92
	Dublin South City	1726	95	95	95	90	95	89	90	91	92	92
	Dublin South West	2438	97	97	97	93	97	89	92	93	95	95
	Dublin West	2725	95	95	95	87	95	83	86	89	91	91
	Dublin North West	3717	93	93	93	86	93	83	86	88	90	90
	Dublin North Central	1892	92	92	92	84	92	81	83	87	89	89
	Dublin North	4202	93	93	93	89	93	86	89	90	91	91
	Kildare/West Wicklow	3860	94	94	94	90	94	88	90	92	93	93
	Wicklow	1790	94	94	94	84	94	80	84	89	91	90
	HSE E Total	**25716**	**94**	**94**	**94**	**88**	**94**	**86**	**88**	**90**	**92**	**92**
HSE M	Laois/Offaly	2452	97	97	97	97	97	91	93	94	96	96
	Longford/ Westmeath	1937	97	97	97	97	97	92	94	95	96	96
	HSE M Total	**4389**	**97**	**97**	**97**	**97**	**97**	**91**	**93**	**94**	**96**	**96**
HSE MW	Clare	1561	94	94	93	92	93	90	93	91	92	92
	Limerick	1842	93	93	93	88	93	85	87	89	90	90
	Tipperary NR/ East Limerick	1850	95	95	95	89	95	86	90	90	93	92
	HSE MW Total	**5253**	**94**	**94**	**94**	**90**	**94**	**87**	**90**	**90**	**92**	**91**
HSE NE	Cavan/ Monaghan	2028	97	97	97	93	97	92	93	95	96	95
	Louth	1966	94	94	94	90	94	89	90	92	93	92
	Meath	3348	96	96	96	91	96	91	91	94	94	93
	HSE NE Total	**7342**	**96**	**96**	**96**	**91**	**96**	**90**	**91**	**93**	**94**	**93**
HSE NW	Donegal	2093	96	96	96	89	94	84	89	89	93	91
	Sligo/Leitrim	1381	97	97	97	96	97	89	97	91	96	96
	HSE NW Total	**3474**	**96**	**97**	**96**	**92**	**95**	**86**	**92**	**90**	**94**	**93**
HSE SE	Carlow/Kilkenny	1978	95	95	95	94	95	88	92	92	94	94
	South Tipperary	1339	97	97	97	96	97	89	93	94	96	95
	Waterford	1890	94	94	94	91	94	87	89	92	93	92
	Wexford	2088	97	97	97	96	96	91	93	94	95	95
	HSE SE Total	**7295**	**96**	**96**	**96**	**94**	**96**	**89**	**92**	**93**	**94**	**94**
HSE S	North Cork	1464	96	96	96	92	97	88	90	92	93	94
	North South Lee	5765	95	95	95	91	95	88	89	92	93	93
	West Cork	746	93	93	93	87	93	83	85	89	90	91
	Kerry	1794	96	96	96	91	96	87	89	91	93	93
	HSE S Total	**9769**	**95**	**95**	**95**	**91**	**96**	**87**	**89**	**91**	**93**	**93**
HSE W	Galway	3648	98	98	98	95	98	95	na	97	na	96
	Mayo	1665	98	98	98	91	98	92	na	98	na	94
	Roscommon	905	98	98	98	96	98	96	na	98	na	97
	HSE W Total	**6218**	**98**	**98**	**98**	**95**	**98**	**94**	**na**	**97**	**na**	**95**
Ireland		**69456**	**95**	**95**	**95**	**91**	**95**	**88**	**90**	**92**	**93**	**93**

* As the denominator/number in cohort varied slightly according to vaccine the D_3, T_3 and P_3 cohorts are shown here
Since T_3 uptake identical to D_3 uptake only D_3 uptake figures are presented
Since $Polio_3$ uptake identical to Hib_3 uptake only Hib_3 uptake figures are presented
Please note while North Lee and South Lee are two separate Local Health Offices their combined immunisation uptake data are reported here

D_3, Hib_b, $MenC_3$ and MMR_1 uptake rates are mapped by LHO in figure 2. Among the LHOs the uptake rates ranged from 92% to 98% for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$, 89% to 97% for MMR_1, 89% to 96% for PCV_b, 87% to 98% for PCV_3, 84% to 97% for Hib_b, 83% to 97% for $MenC_b$ and 80% to 96% for $MenC_3$ (table 3).

The target uptake of ≥95% was reached in 21 LHOs for D_3, T_3, P_3, Hib_3 and $Polio_3$, 20 for $HepB_3$, in nine LHOs for MMR_1, in seven for Hib_b and PCV_b, in five LHOs for PCV_3, in two LHOs for $MenC_3$ and in one LHO for $MenC_b$ (table 3). Galway and Roscommon were the only LHOs to reach the target of ≥95% for D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, Hib_b, $MenC_3$, PCV_3 and MMR_1 for children at 24 months (table 3).

Conclusion

National immunisation uptake rates, in children at 12 months of age in 2015, were 91% for D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_2$ and PCV_2. Based on available data uptake of BCG was 86%. The HSE M and HSE W reached the target uptake rate of ≥95% for D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_2$ and PCV_2 among children at 12 months of age. Among the LHOs, Roscommon had the highest uptake (97%) of D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, $MenC_2$ and PCV_2 at 12 months of age.

In 2015, national uptake rates at 24 months for $MenC_3$ (88%), Hib_b (91%), PCV_3 (92%) and MMR_1 (93%) were lower than the target uptake of ≥95%. In 2015, national uptake rates at 24 months of age for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$ reached the target rate of ≥95%. This is the fifth year national annual uptake rates reached the target of ≥95% for

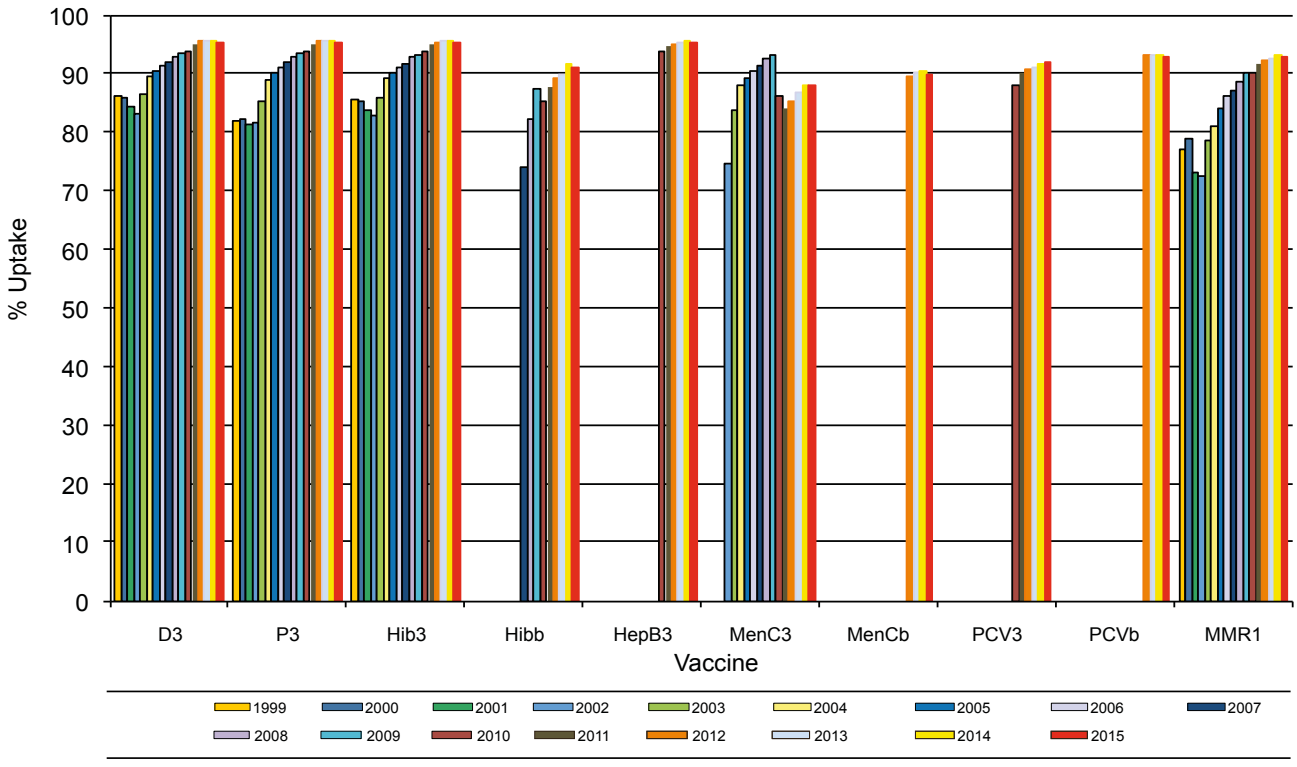

Figure 1. National annual immunisation uptake rates (based on available data) at 24 months, 1999-2015

Since T_3 and $Polio_3$ uptake identical to D_3 uptake only D_3 uptake figures presented.
P_3 uptake could not be calculated accurately during 1999-2001 as DTaP/DT uptake was reported as a combined value for the HSE NE during 1999, Quarters 3 and 4 2000 and Quarter 1 2001 and the HSE NW in 2000 and 2001. The 2002 $MenC_3$ figure is based on uptake rates for Quarter 3 and Quarter 4 2002 only. The 2005 MMR_1 uptake figure is incomplete as the HSE E was unable to provide MMR data for Quarter 4 2005, due to technical problems. The 2006 MMR_1 figure includes the Quarter-1 2006 HSE E figure, which is an estimate only due to technical problems. The 2007 national Hib_b figure is incomplete, as the HSE W data for Quarter 1 2007 and the HSE NW data for Quarter 3 2007 were not available. The 2007 national Hib_b figure also includes the HSE SE data which are an underestimate due to data extraction methods. The 2008 Hib_b figure is incomplete as the HSE SE data for Q2 2008 and the HSE MW data for Quarter 3 2008 were not available. The 2008 national $MenC_3$ figure is incomplete as the HSE E and HSE MW $MenC_3$ data for Quarter 3 2008 were not available. The 2009 data are incomplete as the following were unavailable: the Quarter 1 2009 HSE E D_3, T_3, P_3 and $Polio_3$ data for those born on the 31/03/2007; the Quarter 2 2009 HSE E Dublin North Hib_b uptake data and; the Quarter 4 2009 HSE MW data, HSE E Dublin North Hib_b data and HSE SE Hib_b data for those given a Hib dose as part of the five in one or six in one vaccine after 12 months of age. The 2010 data are incomplete as the following were unavailable: the Quarter 1 2010 HSE M and HSE S data and the HSE E Dublin North Hib_b data; the Quarter 2 2010 HSE M data and; the Quarter 4 2010 HSE NE data. As a new childhood immunisation schedule was introduced in 2008, for those born on or after July 1st 2008, the 2010 $HepB_3$ and PCV_3 data at 24 months are for those born between July 1st and December 31st 2008 (i.e. Quarters 3 and 4 2010 data) only. The $MenC_b$ and PCV_b data were available for only six of the eight HSE Areas from Q1 2012 to Q4 2014 and for seven HSE Areas since Q1 2015.

these vaccines. Based on available data uptake of $MenC_b$ was 90% and uptake of PCV_3 was 93%. The target uptake of ≥95% was reached in six HSE Areas during 2015 for D_3, T_3, P_3, Hib_3, $Polio_3$ and $HepB_3$, in two HSE Areas for Hib_b and MMR_1, in one for PCV_3 and PCV_b and in none for $MenC_3$ and $MenC_b$ (table 3). Galway and Roscommon were the only LHOs to reach the target of ≥95% for D_3, T_3, P_3, Hib_3, $Polio_3$, $HepB_3$, Hib_b, $MenC_3$, PCV_3 and MMR_1 for children at 24 months of age.

Quarterly Reports

The immunisation reports for Quarters 1 to 4 2015 are available on the HPSC website in *Topics A-Z* under the heading *vaccination*.

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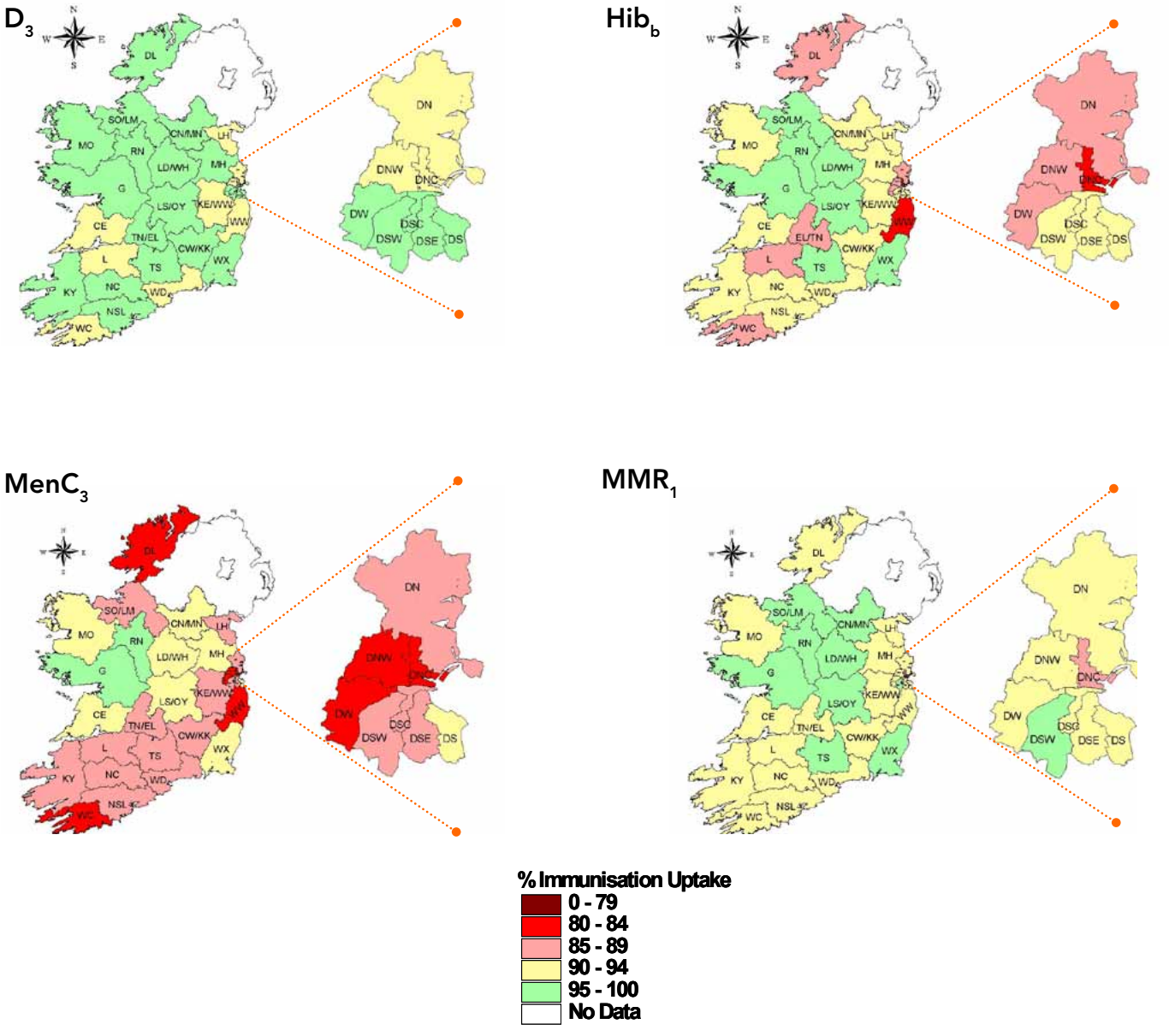

Figure 2. D_3, Hib_b, $MenC_3$ and MMR_1 immunisation uptake rates (%) in those 24 months of age in 2015 by Local Health Office (LHO)
LHOs in Dublin are highlighted separately for ease of viewing
North Lee and South Lee are separate LHOs, however, their combined (labelled NSL on the map) immunisation uptake rate is reported here
Please see table 4 to translate LHO abbreviations

Table 4. Local Health Office (LHO) abbreviations used in this chapter

Local Health Office Abbreviations	Local Health Office
CE	Clare
CN/MN	Cavan/Monaghan
CW/KK	Carlow/Kilkenny
DL	Donegal
DN	Dublin North
DNC	Dublin North Central
DNW	Dublin North West
DS	Dublin South
DSC	Dublin South City
DSE	Dublin South East
DSW	Dublin South West
DW	Dublin West
G	Galway
KE/WW	Kildare/West Wicklow
KY	Kerry
L	Limerick
LD/WD	Longford/Westmeath
LH	Louth
LS/OY	Laois/Offaly
MH	Meath
MO	Mayo
NC	North Cork
NSL*	North South Lee*
RN	Roscommon
SO/LM	Sligo/Leitrim
TN/EL	Tipperary North /East Limerick
TS	South Tipperary
WC	West Cork
WD	Waterford
WX	Wexford
WW	Wicklow

*Please note while North Lee and South Lee are two separate LHOs their combined immunisation uptake data are reported

8.2 DTaP/IPV* and MMR† vaccine uptake 2014/2015

Key Points

Uptake of the DTap/IPV vaccine among junior infant schoolchildren during 2014/2015 in HSE-adminsistered Local Health Offices (LHOs) was 91.5% and in GP-administered LHOs it was 92.3%

Uptake of the MMR vaccine among junior infant schoolchildren during 2014/2015 in HSE-adminsistered LHOs was 91.3% and in GP-administered LHOs it was 91.8%

Background
Uptake of the DTaP-IPV* and MMR† vaccines in 4-5 year old junior Infant schoolchildren was monitored across all Local Health Offices (LHOs) during the academic year 2014/2015. The uptake data provided by immunisation coordinators and other administrative staff[1] to HPSC were entered on to a MS Excel database and compared to those reported for the previous 2013/2014 season, where possible.

HSE-school team versus GP-vaccine administered LHOs
In 29 out the 31 LHOs across the country, the junior infant vaccination programme is delivered by HSE school teams who administer the vaccine to the children at school. In the remaining two LHOs, Donegal and Sligo/Leitrim, these vaccines are administered to children exclusively by GPs rather than by school teams. During 2014/2015 however, a combination of a school team/GP programme also existed in seven HSE-administered LHOs with a percentage of children been given vaccines by a GP (Table 1).

Target populations
For the 2014/2015 academic year, the target population in HSE-vaccine administered LHOs was all children in Junior Infants on the school register on the 30th September 2014. For GP-vaccine administered LHOs, the target population was all children born between the 1st September 2008 and 31st August 2009.

The different ways in which the target populations have been defined in the HSE- and GP-vaccinated administered LHOs has meant that a national uptake for either vaccine could not be calculated.

One of the difficulties in presenting vaccination uptake data by community healthcare organisation (CHO) area is the fact that Donegal and Sligo/Leitrim, two GP–administered LHOs, are part of CHO area 1 which also includes the HSE administered LHO Cavan/Monaghan. This means that the uptake in CHO area 1 cannot be compared to the other eight CHO areas 2 to 9.

[1] Data for the North West area were provided to HPSC by the local Department of Public Health

Table 1. Proportion of DTaP-IPV vaccine and MMR uptake in HSE-administered LHOs attributable to GPs in 2014/2015

LHO	Separate % DTaP-IPV and MMR Vaccine Uptake Administered by GPs
North Cork	46.4%
Kerry	30.9%
North South Lee	12.2%
West Cork	8.9%
Dublin South East	7.4%
Tipperary South	5.2%
Carlow/Kilkenny	3.5%
Wicklow	% not specified
Louth	% not specified

* DTaP-IPV = Diphtheria, Tetanus, acellular Pertussis and Polio vaccine
†MMR = Measles, Mumps and Rubella vaccine
‡ Excludes Meath which reported the number of children requiring a catch up MMR dose, but not the number who were vaccinated

Table 2. Overall uptake of the DTaP-IPV and MMR vaccines in Junior Infants during the 2014/2015 academic year

		HSE-administered LHOs						GP-administered LHOs					
		DTaP-IPV vaccine			MMR vaccine			DTaP-IPV vaccine			MMR vaccine		
CHO	LHO Name	Cohort	Number children who have received 1 dose DTaP-IPV vaccine	%	Cohort	Number children who have received 1 dose MMR vaccine	%	Cohort	Number children who have received 1 dose DTaP-IPV vaccine	%	Cohort	Number children who have received 1 dose MMR vaccine	%
1	Cavan/Monaghan	2,190	1,959	89.5%	2,190	1,930	88.1%	HSE	HSE	HSE	HSE	HSE	HSE
	Donegal	GP	GP	GP	GP	GP	GP	2,444	2,226	91.1%	2,444	2,207	90.3%
	Sligo/Leitrim	GP	GP	GP	GP	GP	GP	1,445	1,363	94.3%	1,445	1,362	94.3%
	CHO 1 Total	**2,190**	**1,959**	**89.5%**	**2,190**	**1,930**	**88.1%**	**3,889**	**3,589**	**92.3%**	**3,889**	**3,569**	**91.8%**
2	Galway	3,915	3,281	83.8%	3,915	3,298	84.2%	HSE	HSE	HSE	HSE	HSE	HSE
	Mayo	1,881	1,628	86.5%	1,881	1,649	87.7%	HSE	HSE	HSE	HSE	HSE	HSE
	Roscommon	976	933	95.6%	976	933	95.6%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 2 Total	**6,772**	**5,842**	**86.3%**	**6,772**	**5,880**	**86.8%**						
3	Clare	1,806	1,556	86.2%	1,806	1,562	86.5%	HSE	HSE	HSE	HSE	HSE	HSE
	Limerick	2,001	1,642	82.1%	2,001	1,639	81.9%	HSE	HSE	HSE	HSE	HSE	HSE
	Tipperary North	2,007	1,757	87.5%	2,007	1,758	87.6%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 3 Total	**5,814**	**4,955**	**85.2%**	**5,814**	**4,959**	**85.3%**						
4	Kerry	2,010	1,876	93.3%	2,010	1,876	93.3%	HSE	HSE	HSE	HSE	HSE	HSE
	North Cork	1,530	1,392	91.0%	1,530	1,391	90.9%	HSE	HSE	HSE	HSE	HSE	HSE
	North Lee/South Lee	5,843	5,479	93.8%	5,843	5,482	93.8%	HSE	HSE	HSE	HSE	HSE	HSE
	West Cork	753	685	91.0%	753	685	91.0%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 4 Total	**10,136**	**9,432**	**93.1%**	**10,136**	**9,434**	**93.1%**						
5	Carlow/Kilkenny	1,879	1,808	96.2%	1,879	1,821	96.9%	HSE	HSE	HSE	HSE	HSE	HSE
	South Tipperary	1,453	1,360	93.6%	1,451	1,362	93.9%	HSE	HSE	HSE	HSE	HSE	HSE
	Waterford	2,012	1,957	97.3%	2,012	1,956	97.2%	HSE	HSE	HSE	HSE	HSE	HSE
	Wexford	2,211	2,055	92.9%	2,211	2,057	93.0%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 5 Total	**7,555**	**7,180**	**95.0%**	**7,553**	**7,196**	**95.3%**						
6	Dublin South	1,913	1,811	94.7%	1,913	1,813	94.8%	HSE	HSE	HSE	HSE	HSE	HSE
	Dublin South East	1,656	1,312	79.2%	1,656	1,329	80.3%	HSE	HSE	HSE	HSE	HSE	HSE
	Wicklow	2,014	1,952	96.9%	2,014	1,943	96.5%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 6 Total	**5,583**	**5,075**	**90.9%**	**5,583**	**5,085**	**91.1%**						
7	Dublin South City	1,579	1,468	93.0%	1,579	1,453	92.0%	HSE	HSE	HSE	HSE	HSE	HSE
	Dublin South West	2,064	1,958	94.9%	2,064	1,968	95.3%	HSE	HSE	HSE	HSE	HSE	HSE
	Dublin West	2,866	2,663	92.9%	2,866	2,654	92.6%	HSE	HSE	HSE	HSE	HSE	HSE
	Kildare/West Wicklow	4,171	4,035	96.7%	4,171	4,023	96.5%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 7 Total	**10,680**	**10,124**	**94.8%**	**10,680**	**10,098**	**94.6%**						
8	Laois/Offaly	2,743	2,459	89.6%	2,743	2,429	88.6%	HSE	HSE	HSE	HSE	HSE	HSE
	Longford/Westmeath	2,170	2,122	97.8%	2,170	2,119	97.6%	HSE	HSE	HSE	HSE	HSE	HSE
	Louth	2,170	1,991	91.8%	2,170	1,952	90.0%	HSE	HSE	HSE	HSE	HSE	HSE
	Meath	3,591	3,440	95.8%	3,591	3,437	95.7%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 8 Total	**10,674**	**10,012**	**93.8%**	**10,674**	**9,937**	**93.1%**						
9	Dublin North	4,415	3,932	89.1%	4,415	3,917	88.7%	HSE	HSE	HSE	HSE	HSE	HSE
	Dublin North Central	1,410	1,269	90.0%	1,410	1,282	90.9%	HSE	HSE	HSE	HSE	HSE	HSE
	Dublin North West	3,177	2,789	87.8 %	3,177	2,758	86.8%	HSE	HSE	HSE	HSE	HSE	HSE
	CHO 9 Total	**9,002**	**7,990**	**88.8%**	**9,002**	**7,957**	**88.4%**						
	National Total	**68,406**	**62,569**	**91.5%**	**68,404**	**62,476**	**91.3%**	**3,889**	**3,589**	**92.3%**	**3,889**	**3,569**	**91.8%**

GP=Vaccine administered by GPs in these areas; HSE=Vaccine administered by HSE public health personnel in these areas; Target population HSE-vaccine administered areas: All children in Junior Infants on the school register on 30/09/2014 for the 2014/2015 academic year; Target population in GP-vaccine administered areas: All children born between 01/09/2008 and 31/08/2009

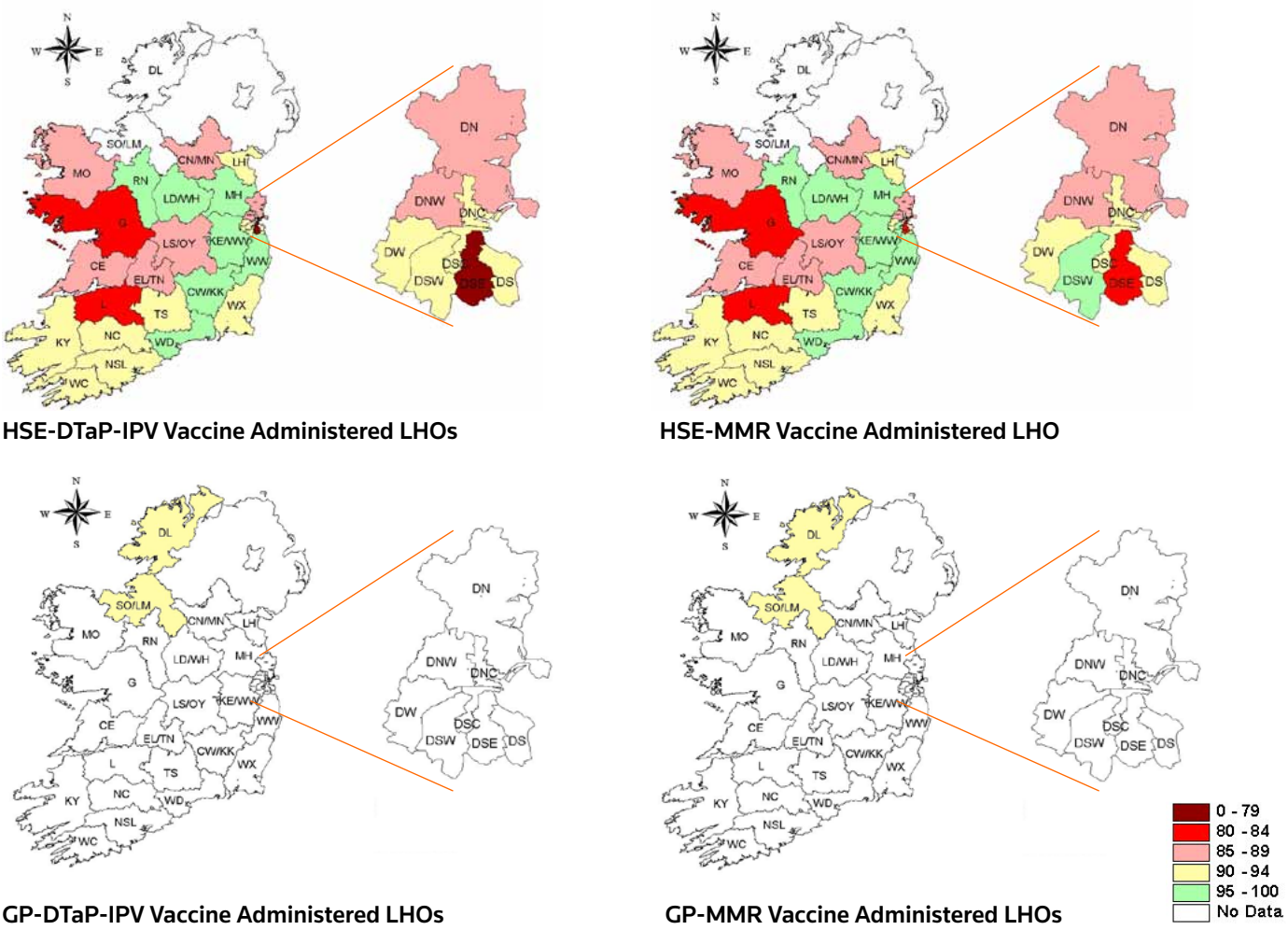

Figure 1. LHO Maps of DTaP-IPV & MMR percentage vaccine uptake at Junior Infants level during the 2014/2015 academic year

Uptake of DTaP-IPV vaccine
Between 2013/2014 and 2014/2015, the overall uptake of the DTaP-IPV vaccine in HSE-vaccine administered LHOs remained unchanged at 91.5%. In 2014/2015, the average uptake among these LHOs was 91.4% with a range from 79.2% in Dublin South East to 97.8% in Longford/Westmeath. Of the 29 HSE administered LHOs, 14 reported an average uptake decline of 3.4% whilst 15 others reported an average increase of 3.3%. The largest reduction in uptake was reported by Galway (-11.9%) and the highest increase was reported by Dublin North Central (+12.6%).

During the same period of time, overall DTaP-IPV vaccine uptake in exclusively GP-vaccine administered LHOs (Donegal; Sligo/Leitrim) rose slightly from 92.2% to 92.3%: Donegal reported an uptake reduction of 1.0%, whilst Sligo/Leitrim reported an increase of 2.1%.

Uptake of MMR vaccine
The overall uptake of the MMR vaccine between 2013/2014 and 2014/2015 in HSE-vaccine administered LHOs remain unchanged at 91.3% In 2014/2015, the average uptake among these LHOs was also 91.3% with a range from 80.3% in Dublin South East to 97.6% in Longford/Westmeath. Of the 29 HSE administered LHOs, 13 reported an average uptake reduction of 3.4% whilst 16 others reported an average increase of 3.0%. The largest reduction in uptake was reported by Galway (-10.5%) and the highest increase was reported by Dublin North Central (+10.6%).

Overall MMR vaccine uptake in exclusively GP-vaccine administered LHOs decreased from 92.7% to 91.8% during the same time period: Donegal reported an uptake decrease of 1.7%, whilst Sligo/Leitrim reported an increase of 1.2%.

MMR catch-up vaccination
Fiftteen‡ HSE-vaccine administered LHOs reported on the number of children needing a catch-up MMR dose one month later after been given their first dose. The total number of children identified was 139 (range zero to 32). Of these 139 children, 56 (40.3%) received a catch-up vaccine dose (range zero to 19) (data not shown).

Details of the overall uptake of the two vaccines in the HSE- and GP-vaccinated LHOs during 2014/2015 are presented in Table 2 and in the maps in Figure 1.

Acknowledgements
Many thanks to all HSE staff, Department of Education and Skills staff, staff in all educational settings, GPs, parents and children/students, who implemented, participated in and supported all these vaccination programmes.

8.3 HPV, MenC booster and Tdap vaccine uptake 2014/2015

Key Points

Among the recommended cohorts in the academic year 2014/2015:

86.9% of girls had at least stage 2 HPV vaccine (considered to have completed a two dose HPV vaccine course);

87.9% of children had MenC booster vaccine and;

89.1% of children had Tdap vaccine.

Background

HPV

Following a recommendation from the National Immunisation Advisory Committee (NIAC), that human papillomavirus (HPV) vaccine should be given to 12 year old girls, a routine Health Service Executive (HSE) school HPV vaccination programme began in May 2010 for girls in the first year of second level school and age equivalent in special schools and home schooled. The aim of the programme is to protect girls from their future risk of developing cervical cancer.

An HPV catch-up campaign for girls in sixth year of second level schools and their age equivalents in non-second level schools (ie special schools, home schooled, Community Training Centres and Youthreach) was added in the academic year 2011/2012 and continued during the academic years 2012/2013 and 2013/2014.

Quadrivalent HPV vaccine, which protects against HPV types 6, 11, 16 and 18 associated with 70% of cervical cancer, is used in the school vaccination programme. A schedule of two vaccine doses given at least six months apart was recommended in the academic year 2014/2015 for girls aged <15 years. Prior to this a schedule of three vaccine doses given over a six month period was recommended. This change is based on recent data which showed that the immune response to two doses of the vaccine in 9-13 year old girls is comparable to a three dose course. The HPV vaccine does not protect against all cervical cancers, so regular cervical screening is still needed.

Tdap

The NIAC recommends vaccination with Tdap (tetanus and low-dose diphtheria and acellular pertussis) vaccine at 11-14 years of age. The Tdap vaccine was introduced to the HSE schools immunisation programme on a phased basis from September 2011. The HSE extended the Tdap vaccination programme to all areas from September 2012. This vaccine is offered to students in first year of second level school and their age equivalents in special schools and home schooled. It replaces the previous school based Td (Tetanus and low dose diphtheria) vaccination programme. The adolescent booster was changed because more cases of pertussis have been occurring in adolescents and adults due to the waning immunity that occurs over time, combined with a reduction in natural boosting.

MenC

MenC (meningococcal group C) vaccine is recommended as part of the primary childhood immunisation programme. In recent years, evidence has emerged that immunity to meningococcal disease reduces over time, so a booster dose is recommended now to provide additional protection. The NIAC recommends vaccination with a booster MenC vaccine at 12-13 years of age. The MenC booster vaccine was introduced into the HSE schools immunisation programme in September 2014. This vaccine is offered to students in first year of second level schools and their age equivalents in special schools and home schooled.

The target for uptake of two doses of vaccine for the HPV vaccination programme is ≥80% and target uptake of MenC booster and Tdap vaccine is ≥95%.

The vaccinations are provided by vaccination teams from the Local Health Offices (LHOs) who go into schools in their areas to vaccinate or provide vaccination clinics free of charge for children in the target cohorts. Vaccinations provided through the schools immunisation programme are entered into the School Immunisation System (SIS). Please see the HSE-National Immunisation Office (NIO) website at http://www.immunisation.ie for detailed and current information on the school vaccination programme.

Cohort for vaccination in the academic year 2014/2015

The cohort for the 2014/2015 HPV, Tdap and MenC booster vaccination programme was children (girls only for HPV vaccine)

- in **first year of second level schools**
- **and their age equivalents** ie those who were born

between 01/09/2002 and 31/08/2003
- attending special schools or
- registered with the National Educational Welfare Board to be home schooled.

Terminology used in this report
At least stage 1 - means a girl had a stage 1 HPV vaccine recorded on SIS, this girl may or may not have had a stage 2 HPV vaccine recorded on SIS. At least stage 2 - means a girl had a stage 2 HPV vaccine recorded on SIS, she may or may not have had stage 1 HPV vaccine recorded on SIS. Girls with at least stage 2 HPV are considered to have completed a course of vaccination. Prior to the 2014/2015 academic year girls with at least stage 3 HPV were considered to have completed a course of vaccination.

Home schooled - refers to children registered with the National Educational Welfare Board to be educated at home. These children were recorded on SIS and reported here as home schooled.

Out of school - refers to vaccinated children who were neither enrolled in a second level school, special school nor registered with the National Educational Welfare Board as home schooled.

Local Health Office (LHO) - refers to the LHO the school is located in (it does not refer to the LHO the child is resident in).

Outside cohort - refers to those who were vaccinated but who were not in first year of second level schools or their equivalents in non-second level schools ie they were outside the cohorts recommended for vaccination.

The denominator for second level schools was defined as the number of children (girls only for HPV vaccine) on the school roll on 30th September 2014 for first year. The denominator for age equivalent to first years in second level schools was defined as children (girls only for HPV vaccine) born between 01/09/2002 and 31/08/2003 on the school roll of special schools or registered with the National Educational Welfare Board on 30th September 2014. All the denominator data was entered onto SIS by the relevant System Administrator.

Uptake of HPV, MenC booster and Tdap vaccines
Here we report on the uptake of HPV, MenC booster and Tdap vaccines in the academic year 2014/2015, provided through the school immunisation programme and recorded on SIS on the 9th August 2016. These figures are subject to change due to ongoing updating of data on the database.

The data presented here are the result of collaboration between NIO, School Immunisation Teams, Immunisation Coordinators, Immunisation System Administrators, Immunisation administrative staff and HPSC.

Uptake of HPV vaccine
In Ireland, 86.9% of girls in second level schools and their equivalents in special schools and home schooled were recorded as having received at least HPV stage 2 (considered to have completed a two dose course) (Table 1). Data are not directly comparable with previous academic years. In previous years a three dose schedule was recommended. In the academic year 2013/2014 88.2% of girls in first year in second level schools were recorded as having received at least HPV stage 2 while 84.9% of girls in first year in second level schools were recorded as having received at least HPV stage 3.[1]

Among the nine Community Healthcare Organisations (CHOs), in the academic year 2014/2015, uptake of at least HPV stage 2 among girls ranged from 77.4% to 90.8%; with eight reaching the target of >=80% uptake.

In 2014/2015 academic year, an additional 271 girls were recorded as being outside the cohort recommended for vaccination and having received at least HPV stage 2 (Table 1).

Uptake of MenC booster vaccine
Uptake of the MenC booster vaccine in children in first year in second level schools and their equivalents in special schools and home schooled was 87.9% (Table 2).There was some regional variation with uptake among the CHOs ranging from 76.4% to 93.3%.

An additional 283 children were recorded as being outside the cohort recommended for vaccination and having received MenC booster vaccine (Table 2).

Uptake of Tdap vaccine
In the academic year 2014/2015, uptake of the Tdap vaccine in children in first year in second level schools and their equivalents in special schools and home schooled was 89.1% (Table 3). Uptake was 82.7% in the academic year 2013/2014 among the 31 LHOs, out of a total of 32 LHOs, reporting data.[2]

In the academic year 2014/2015, there was some regional variation with uptake among the CHOs ranging from 79.2% to 93.7%.

In 2014/2015, an additional 329 children were recorded as being outside the cohort recommended for vaccination and having received Tdap vaccine (Table 3).

Acknowledgements
Many thanks to all HSE staff, school immunisation teams, immunisation co-ordinators, immunisation system administrators, immunisation administrative staff, Department of Education and Skills staff, staff in all educational settings, parents and children/students, who implemented, participated in and supported the school vaccination programme.

References
1. HSE. HPV vaccine uptake in Ireland: 2013/2014. Available at https://www.hpsc.ie/A-Z/VaccinePreventable/Vaccination/ImmunisationUptakeStatistics/HPVImmunisationUptakeStatistics/File,15198,en.pdf

2. HSE. Tdap vaccine uptake in Ireland: 2013/2014. Available at http://www.hpsc.ie/A-Z/VaccinePreventable/Vaccination/ImmunisationUptakeStatistics/TdapImmunisationUptakeStatistics/File,15199,en.pdf

Table 1. HPV vaccine uptake data, provided through the school immunisation programme, among girls in the academic year 2014/2015 (data extracted from SIS 09/08/2016)

Community Healthcare Organisation (CHO)	Local Health Office/Community Healthcare Organisation (CHO)	2014/2015							
		Girls in first year in second level schools and age equivalent in special schools, home schooled and out of school*					Outside cohort		
			Numbers vaccinated with:		% Vaccinated with:			Numbers vaccinated with:	
		Denominator	at least stage 1	at least stage 2	at least stage 1	at least stage 2	Denominator	at least stage 1	at least stage 2
CHO1	Cavan/Monaghan	884	752	739	85.1%	83.6%	N/A	1	1
	Donegal	1148	1055	1042	91.9%	90.8%	N/A	3	3
	Sligo/Leitrim	639	573	557	89.7%	87.2%	N/A	0	0
	CHO1 Total	**2671**	**2380**	**2338**	**89.1%**	**87.5%**	**N/A**	**4**	**4**
CHO2	Galway	1454	1468	1409	101.0%	96.9%	N/A	3	3
	Mayo	890	749	732	84.2%	82.2%	N/A	47	45
	Roscommon	316	280	274	88.6%	86.7%	N/A	2	2
	CHO2 Total	**2660**	**2497**	**2415**	**93.9%**	**90.8%**	**N/A**	**52**	**50**
CHO3	Clare	784	701	690	89.4%	88.0%	N/A	3	3
	Limerick	917	834	795	90.9%	86.7%	N/A	1	1
	Tipperary NR/East Limerick	1007	924	893	91.8%	88.7%	N/A	2	2
	CHO3 Total	**2708**	**2459**	**2378**	**90.8%**	**87.8%**	**N/A**	**6**	**6**
CHO4	North Cork	607	545	530	89.8%	87.3%	N/A	4	4
	North Lee - Cork	1193	1091	1060	91.5%	88.9%	N/A	3	2
	South Lee - Cork	1304	1139	1119	87.3%	85.8%	N/A	1	1
	West Cork	363	303	297	83.5%	81.8%	N/A	1	1
	Kerry	944	815	765	86.3%	81.0%	N/A	1	1
	CHO4 Total	**4411**	**3893**	**3771**	**88.3%**	**85.5%**	**N/A**	**10**	**9**
CHO5	Carlow/Kilkenny	1049	968	948	92.3%	90.4%	N/A	7	7
	South Tipperary	566	525	515	92.8%	91.0%	N/A	13	9
	Waterford	853	803	793	94.1%	93.0%	N/A	0	0
	Wexford	1076	972	948	90.3%	88.1%	N/A	1	1
	CHO5 Total	**3544**	**3268**	**3204**	**92.2%**	**90.4%**	**N/A**	**21**	**17**
CHO6	Dublin South	928	844	834	90.9%	89.9%	N/A	12	7
	Dublin South East	701	594	584	84.7%	83.3%	N/A	4	4
	Wicklow	743	667	640	89.8%	86.1%	N/A	2	1
	CHO6 Total	**2372**	**2105**	**2058**	**88.7%**	**86.8%**	**N/A**	**18**	**12**
CHO7	Dublin South City	821	754	707	91.8%	86.1%	N/A	0	0
	Dublin South West	824	711	694	86.3%	84.2%	N/A	0	0
	Dublin West	1075	960	885	89.3%	82.3%	N/A	2	1
	Kildare/West Wicklow	1645	1604	1577	97.5%	95.9%	N/A	4	3
	CHO7 Total	**4365**	**4029**	**3863**	**92.3%**	**88.5%**	**N/A**	**6**	**4**
CHO8	Laois/Offaly	1051	978	952	93.1%	90.6%	N/A	0	0
	Longford/Westmeath	1128	1011	985	89.6%	87.3%	N/A	5	5
	Louth	1002	882	860	88.0%	85.8%	N/A	2	2
	Meath	1266	1197	1161	94.5%	91.7%	N/A	5	4
	CHO8 Total	**4447**	**4068**	**3958**	**91.5%**	**89.0%**	**N/A**	**12**	**11**
CHO9	Dublin North West	1350	1096	1014	81.2%	75.1%	N/A	3	3
	Dublin North Central	749	631	626	84.2%	83.6%	N/A	1	1
	Dublin North	1526	1233	1167	80.8%	76.5%	N/A	155	154
	CHO9 Total	**3625**	**2960**	**2807**	**81.7%**	**77.4%**	**N/A**	**159**	**158**
Home schooled		35	9	7	25.7%	20.0%	N/A	0	0
Total of LHOs and home schooled		**30838**	**27668**	**26799**	**89.7%**	**86.9%**	**N/A**	**288**	**271**
Out of School		N\A	1	1	N\A	N\A	N\A	0	0
Total of LHOs and home schooled and out of school		N\A	27669	26800	N\A	N\A	N\A	288	271

The figures presented in this table are based on data recorded on the School Immunisation System (SIS) on the 9th August 2016. These figures are subject to change due to ongoing updating of data on SIS.

Local health office (LHO) refers to the LHO of the school. Therefore, in reports the LHOs of home schooled and out of school children do not appear.

Outside cohort refers to those who were vaccinated but who were outside the routine cohort for vaccination.

N/A-Not applicable

'At least stage 1' means a girl had a stage 1 HPV vaccine recorded on SIS, this girl may or may not have had a stage 2 vaccine recorded on SIS. Similarly, 'at least stage 2' means a girl had a stage 2 HPV vaccine recorded on SIS, she may or may not have had a stage 1 HPV vaccine recorded on SIS.

*Please see the background section of this report for details of the cohorts recommended HPV vaccine during the academic year 2014/2015.

Table 2. MenC booster vaccine uptake data, provided through the school immunisation programme, among children in the academic year 2014/2015 (data extracted from SIS 09/08/2016)

Community Healthcare Organisation (CHO)	Local Health Office/Community Healthcare Organisation (CHO)	2014/2015				
		Children in first year in second level schools and age equivalent in special schools, home schooled and out of school*			Outside cohort	
		Denominator	Numbers vaccinated with MenC booster	% Vaccinated with MenC booster	Denominator	Numbers vaccinated with MenC booster
CHO1	Cavan/Monaghan	1788	1511	84.5%	N/A	6
	Donegal	2355	2211	93.9%	N/A	2
	Sligo/Leitrim	1299	1214	93.5%	N/A	0
	CHO1 Total	**5442**	**4936**	**90.7%**	**N/A**	**8**
CHO2	Galway	2986	2870	96.1%	N/A	0
	Mayo	1744	1554	89.1%	N/A	1
	Roscommon	641	586	91.4%	N/A	0
	CHO2 Total	**5371**	**5010**	**93.3%**	**N/A**	**1**
CHO3	Clare	1544	1367	88.5%	N/A	0
	Limerick	1963	1625	82.8%	N/A	3
	Tipperary NR/East Limerick	1958	1721	87.9%	N/A	2
	CHO3 Total	**5465**	**4713**	**86.2%**	**N/A**	**5**
CHO4	North Cork	1196	1021	85.4%	N/A	1
	North Lee - Cork	2548	2287	89.8%	N/A	0
	South Lee - Cork	2567	2300	89.6%	N/A	0
	West Cork	706	604	85.6%	N/A	0
	Kerry	1904	1608	84.5%	N/A	0
	CHO4 Total	**8921**	**7820**	**87.7%**	**N/A**	**1**
CHO5	Carlow/Kilkenny	2059	1906	92.6%	N/A	1
	South Tipperary	1225	1150	93.9%	N/A	38
	Waterford	1783	1704	95.6%	N/A	1
	Wexford	2180	1997	91.6%	N/A	1
	CHO5 Total	**7247**	**6757**	**93.2%**	**N/A**	**41**
CHO6	Dublin South	2015	1819	90.3%	N/A	1
	Dublin South East	1278	1070	83.7%	N/A	16
	Wicklow	1512	1340	88.6%	N/A	2
	CHO6 Total	**4805**	**4229**	**88.0%**	**N/A**	**19**
CHO7	Dublin South City	1491	1253	84.0%	N/A	1
	Dublin South West	1830	1475	80.6%	N/A	1
	Dublin West	2050	1821	88.8%	N/A	1
	Kildare/West Wicklow	3461	3318	95.9%	N/A	7
	CHO7 Total	**8832**	**7867**	**89.1%**	**N/A**	**10**
CHO8	Laois/Offaly	2201	2014	91.5%	N/A	1
	Longford/Westmeath	2267	2038	89.9%	N/A	8
	Louth	2156	1833	85.0%	N/A	2
	Meath	2780	2489	89.5%	N/A	5
	CHO8 Total	**9404**	**8374**	**89.0%**	**N/A**	**16**
CHO9	Dublin North West	2729	2064	75.6%	N/A	0
	Dublin North Central	1618	1255	77.6%	N/A	0
	Dublin North	3011	2303	76.5%	N/A	182
	CHO9 Total	**7358**	**5622**	**76.4%**	**N/A**	**182**
Home schooled		94	12	12.8%	N/A	0
Total of LHOs and home schooled		**62939**	**55340**	**87.9%**	**N/A**	**283**
Out of School		N\A	2	N\A	N\A	0
Total of LHOs and home schooled and out of school		N\A	55342	N\A	N\A	283

The figures presented in this table are based on data recorded on the School Immunisation System (SIS) on the 9th August 2016. These figures are subject to change due to ongoing updating of data on SIS.

Local health office (LHO) refers to the LHO of the school. Therefore, in reports the LHOs of home schooled and out of school children do not appear.

Outside cohort refers to those who were vaccinated but who were outside the routine cohort for vaccination.

N/A-Not applicable

*Please see the background section of this report for details of the cohort recommended MenC booster vaccine during the academic year 2014/2015.

Table 3. Tdap vaccine uptake data, provided through the school immunisation programme, among children in the academic year 2014/2015 (data extracted from SIS 09/08/2016)

Community Healthcare Organisation (CHO)	Local Health Office/ Community Healthcare Organisation (CHO)	2014/2015				
		Children in first year in second level schools and age equivalent in special school, home schooled and out of school*			Outside cohort	
		Denominator	Numbers vaccinated with Tdap	% Vaccinated with Tdap	Denominator	Numbers vaccinated with Tdap
CHO1	Cavan/Monaghan	1788	1521	85.1%	N/A	4
	Donegal	2355	2212	93.9%	N/A	1
	Sligo/Leitrim	1299	1211	93.2%	N/A	1
	CHO1 Total	**5442**	**4944**	**90.8%**	**N/A**	**6**
CHO2	Galway	2986	2868	96.0%	N/A	3
	Mayo	1744	1566	89.8%	N/A	0
	Roscommon	641	600	93.6%	N/A	0
	CHO2 Total	**5371**	**5034**	**93.7%**	**N/A**	**3**
CHO3	Clare	1544	1374	89.0%	N/A	7
	Limerick	1963	1640	83.5%	N/A	7
	Tipperary NR/East Limerick	1958	1759	89.8%	N/A	5
	CHO3 Total	**5465**	**4773**	**87.3%**	**N/A**	**19**
CHO4	North Cork	1196	1031	86.2%	N/A	1
	North Lee - Cork	2548	2310	90.7%	N/A	0
	South Lee - Cork	2567	2305	89.8%	N/A	2
	West Cork	706	610	86.4%	N/A	0
	Kerry	1904	1610	84.6%	N/A	2
	CHO4 Total	**8921**	**7866**	**88.2%**	**N/A**	**5**
CHO5	Carlow/Kilkenny	2059	1905	92.5%	N/A	18
	South Tipperary	1225	1143	93.3%	N/A	39
	Waterford	1783	1685	94.5%	N/A	0
	Wexford	2182	2002	91.8%	N/A	0
	CHO5 Total	**7249**	**6735**	**92.9%**	**N/A**	**57**
CHO6	Dublin South	2015	1823	90.5%	N/A	17
	Dublin South East	1278	1092	85.4%	N/A	4
	Wicklow	1512	1363	90.1%	N/A	6
	CHO6 Total	**4805**	**4278**	**89.0%**	**N/A**	**27**
CHO7	Dublin South City	1491	1310	87.9%	N/A	0
	Dublin South West	1830	1460	79.8%	N/A	1
	Dublin West	2050	1845	90.0%	N/A	7
	Kildare/West Wicklow	3361	3385	100.7%	N/A	9
	CHO7 Total	**8732**	**8000**	**91.6%**	**N/A**	**17**
CHO8	Laois/Offaly	2204	2051	93.1%	N/A	1
	Longford/Westmeath	2267	2074	91.5%	N/A	9
	Louth	2153	1842	85.6%	N/A	4
	Meath	2780	2535	91.2%	N/A	6
	CHO8 Total	**9404**	**8502**	**90.4%**	**N/A**	**20**
CHO9	Dublin North West	2729	2148	78.7%	N/A	7
	Dublin North Central	1618	1285	79.4%	N/A	0
	Dublin North	3011	2398	79.6%	N/A	168
	CHO9 Total	**7358**	**5831**	**79.2%**	**N/A**	**175**
Home schooled		94	12	12.8%	N/A	0
Total of LHOs and home schooled		**62841**	**55975**	**89.1%**	**N/A**	**329**
Out of School		N\A	0	N\A	N\A	0
Total of LHOs and home schooled and out of school		N\A	55975	N\A	N\A	329

The figures presented in this table are based on data recorded on the School Immunisation System (SIS) on the 9th August 2016. These figures are subject to change due to ongoing updating of data on SIS.

Local health office (LHO) refers to the LHO of the school. Therefore, in reports the LHOs of home schooled and out of school children do not appear.

Outside cohort refers to those who were vaccinated but who were outside the routine cohort for vaccination.

N/A-Not applicable

*Please see the background section of this report for details of the cohort recommended MenC booster vaccine during the academic year 2014/2015

8.4 Seasonal influenza vaccine uptake in hospitals & Long Term Care Facilities (LTCFs) in 2015-2016 influenza season

Summary

Influenza vaccine uptake in hospitals, 2015-2016 (n=50 hospitals)

- 89.7% (52/58) of known hospitals (including three private ones) participated
- Based on 50 complete returns:
  - Average uptake among all categories of hospital HCWs was 22.5%
  - Average uptake varied by HSE staff category (16.7-38.2%), the highest value was reported among 'medical and dental' professionals and lowest among 'nursing' staff
  - 7 (14.0%) hospitals exceeded the 40% national uptake target
  - Average uptake varied by Hospital Group (range 14.7-37.6%)
  - Highest average uptake was reported in Acute Paediatric Services Hospital group
  - Average uptake generally increased as the category size of eligible staff within hospitals also increased

Influenza vaccine uptake in LTCFs, 2015-2016 (n=98 LTCFs)

- 44.1% (101/229) of known LTCFs participated
- Based on 98 complete returns:
  - Average uptake among all categories of LTCF HCWs was 26.6%
  - At national level, the average uptake varied by HSE staff category (25.7-43.4%), the highest value was reported among 'medical and dental' professionals and lowest among 'nursing' staff
  - 18 (18.4%) LTCFs exceeded the 40% national uptake target
  - Average uptake varied by Community Health Organisation (CHO) (range 15.2-48.1%)
  - Highest average uptake was reported in CHO 9 (Dublin North, Dublin North Central, Dublin North West)
  - No association was observed between average uptake and the category size of eligible staff within LTCFs
- Uptake among long stay residents since the beginning of the season was 87.5% among 101 LTCFs
- Uptake among respite residents vaccinated within 101 LTCFs was 11.2%
- Uptake among respite residents vaccinated before admission to 101 LTCFs was 26.8%

The National Immunisation Advisory Committee (NIAC) of the RCPI and the HSE recommends annual seasonal influenza vaccination to individuals at risk of severe influenza disease (those who are aged 65 and older, pregnant, morbidly obese and those with specified chronic medical conditions requiring regular follow up), to certain occupational groups (those working with poultry, wild fowl and pigs), health care workers (HCWs) and to those likely to transmit influenza to those at high risk of influenza complications. HSE provides the seasonal influenza vaccine free of charge to all health care facilities or to the occupational health departments of these facilities. Implementation of the vaccination programme is, for the most part, organised by the health care facility management or the relevant occupational health provider.

Influenza can cause severe disease in both patients and staff and infection can spread rapidly in health care settings. Achieving a high uptake of influenza vaccination among HCWs is therefore recognised as an important infection control intervention and occupational health issue. The HSE Leadership team has recommended a national influenza vaccination target of 40% among HCWs since October 2013.

HPSC has collected data on seasonal influenza vaccination coverage among hospitals and long term care facilities

(LTCFs) since the 2011-2012 influenza season. A protocol has also been provided to all facilities outlining the rationale and methodology for data collection each year since then. For the 2015-2016 season, a similar protocol as used for previous years was distributed to all facilities and posted on the HPSC website. Separate online survey forms for hospitals and LTCFs were designed to capture aggregate data on eligible and vaccinated staff and were based on six categories of HSE staff: management & administration; medical & dental; nursing; health & social care professionals; other patient & client care; and general support staff.

For hospitals, occupational health departments were asked to provide data on the number and category of HCWs vaccinated by the service (numerator). The human resource (HR) departments were requested to provide data on the numbers of staff employed (denominator). For LTCFs, uptake details were sought from nominated coordinators (or other named contacts) on the number of staff, residents and respite care patients present and vaccinated during the influenza season.

For the 2015-2016 season, a link to an online form was emailed to each nominated coordinator (or contact person) in 58 known public hospitals (including seven private ones) and separately to 229 HSE funded LTCFs [1] on 9th December 2015. Each coordinator was asked to complete the online form using aggregate uptake data since the beginning of October 2015. A second and final survey seeking aggregate data for the entire season was sent on 25th April 2016. Reminders were sent to non-responders in January (for mid-season data) and May (for end of year data).

This report presents a summary of key data relating to the influenza vaccination uptake programme for 2015-2016, which is now available on the HPSC website. For this report, average uptake results (rather than overall figures as in previous annual reports) were calculated and this was done for two reasons: 1) the average is a measure that takes account of the different number of reporting institutions each season and 2) the numbers of participating hospitals

1 These also include privately funded facilities, some of which are approved by the HSE, are registered with HIQA or avail of the Nursing Home Support Scheme

*Table 1. Details of seasonal influenza vaccine uptake among hospital-based HCWs by influenza season**

Season	Total No. Eligible HCWs**	Total No. Vaccinated HCWs	Average % Uptake	Average % Uptake 95% CIs	Median % Uptake	Range % Uptake	No. Participating Hospitals
2011-2012	46329.02	8275	**17.7**	14.68-20.75	15.7	4.00-39.98	42
2012-2013	41995.16	7325	**14.6**	11.59-17.52	11.0	3.48-38.79	35
2013-2014	50202.39	12234	**21.5**	18.48-24.49	19.4	2.56-45.87	46
2014-2015	51324.22	12006	**21.3**	17.57-25.01	20.1	1.12-47.53	45
2015-2016	59204.52	14833	**22.5**	19.38-25.62	19.8	6.89-47.04	50

*based on complete returns only; **figures include decimal places because some hospitals reported whole time equivalent staff numbers rather than their actual numbers of staff

*Table 2. Details of seasonal influenza vaccine uptake among LTCF-based HCWs by influenza season**

Season	Total No. Eligible HCWs**	Total No. Vaccinated HCWs	Average % Uptake	Average % Uptake 95% CIs	Median % Uptake	Range % Uptake	No. Participating LTCFs
2011-2012	4705	849	**16.0**	11.45-20.58	10.0	0-90.38	70
2012-2013	14458.01	2082	**16.6**	13.92-19.25	11.8	0-76	137
2013-2014	14053.8	3268	**26.0**	22.13-29.9	20.6	0-100	117
2014-2015	10658	2739	**28.1**	24.2-32.09	25.0	0-96.42	91
2015-2016	9354.64	2420	**26.6**	22.65-30.47	22.8	0-100	98

*based on complete returns only; **some figures include decimal places because some LTCFs reported whole time equivalent staff numbers rather than their actual numbers of staff

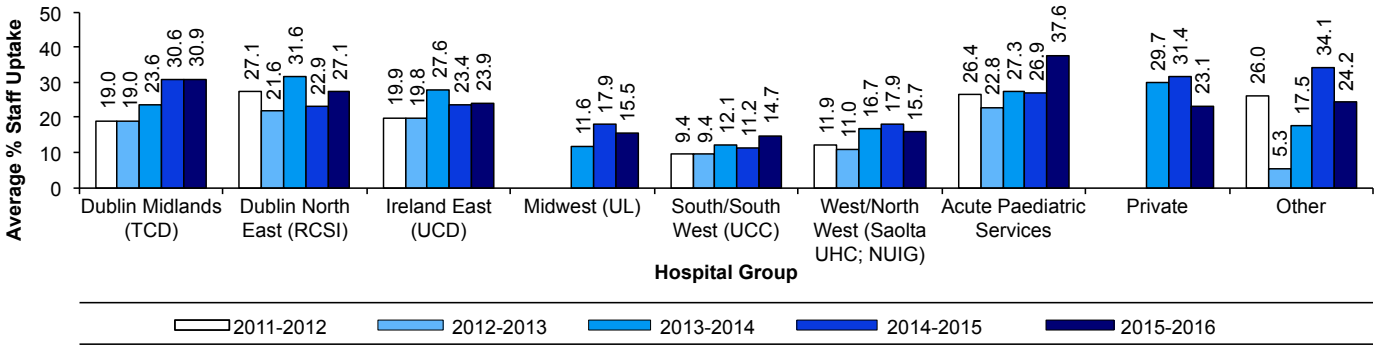

Figure 1. Hospital staff uptake by HSE region by season

and LTCFs that have provided complete data in each of the five seasons since 2011-2012 are relatively low.

Figures 1 to 4 below give details of vaccine uptake among HCWs based in hospitals and LTCFs that reported over the past five seasons by category of staff and HSE Hospital Group or Community Health Organisation.

Hospitals

Fifty-two hospitals participated in the 2015-2016 survey and 50 of them provided complete returns, of which seven (14.0%) exceeded the 40% national uptake target, compared to four (8.9%) of the 45 hospitals in the previous season.
Average uptake varied by Hospital Group from 14.7% to 37.6% among the 50 responding hospitals during 2015-2016 that provided complete returns, with average uptakes highest in the Acute Paediatric Services group and lowest in the South/South West (UCC) group (Figure 1).

At national level, the average uptake varied by HSE staff category (16.7-38.2%), with the highest value reported among 'medical and dental' professionals and lowest among 'nursing' staff. Between 2014-2015 and 2015-2016 average uptake increased among medical and dental professionals (+6.3%), health and social care professionals (+3.7%), general support staff (+2.8%), nursing staff (+0.1%), but declined among other patient and client care staff (-1.1%) and management and administration (-2.1%) (Figure 2).

When hospital staff sizes were categorised, average uptake increased as staff size increased: average uptake was lowest where staff size was <250 HCWs at 11.8% and highest when staff size was >=2000 HCWs at 26.5%.

Long term care facilities

One hundred and one LTCFs participated in the 2015-2016 survey and 98 of them provided complete returns, of which 18 (18.4%) exceeded the 40% national uptake target, compared to 24 (26.3%) of the 91 LTCFs in the previous season.
Average uptake varied by CHO from 15.2% to 48.1% among the 98 responding LTCFs during 2015-2016 that provided complete returns, with average uptakes lowest in CHO 5 and highest in CHO 9 (Figure 3).

Between 2014-2015 and 2015-2016 average uptake decreased across all staff grades with the exception of general support staff (+0.6%): medical and dental staff (-11.7%), health and social care professionals (-11.0%), other patient and client care professionals (-3.8%), nursing (-1.5%) and management and administration staff (-1.2%) (Figure 4).

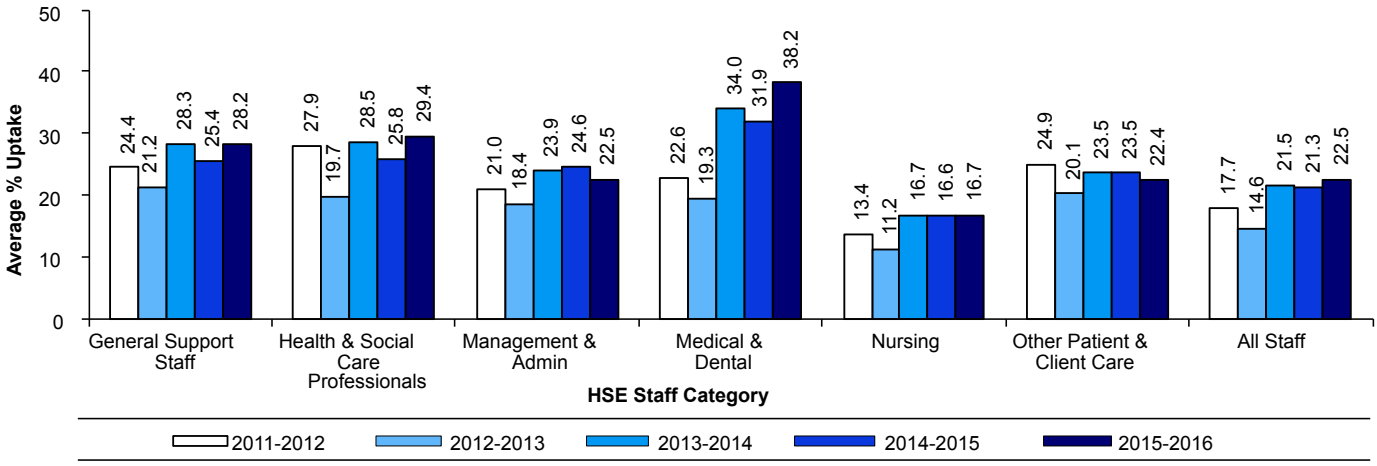

Figure 2. Hospital staff uptake by HSE grade category by season

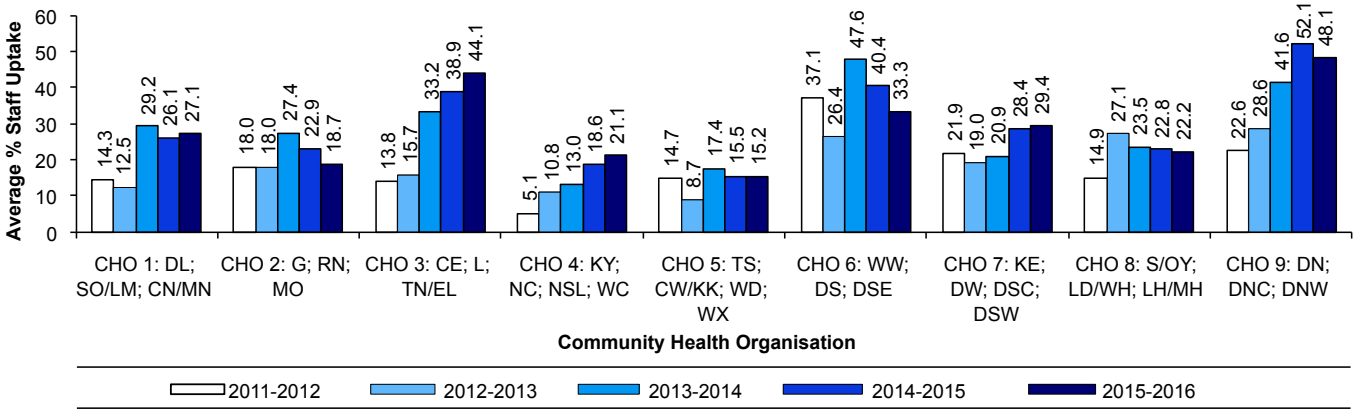

Figure 3. LTCF staff uptake by HSE region by season

When LTCF staff sizes were categorised, average uptake did not increase as staff size increased: average uptake was highest when staff size was <50 HCWs at 28.9% in 2015-2016.

Uptake among long stay residents since the beginning of the season decreased from 96.9% among 100 LTCFs in 2014-2015 to 87.5% among a different combination of 100 LTCFs[2] in 2015-2016. The percentage of respite residents vaccinated prior to admission in 2015-2016 was 26.8%. In contrast, over the same period, the percentage of respite residents vaccinated in-house among the same LTCFs was 11.2%. The percentage of LTCFs that reported having a policy recommending that respite residents are vaccinated before being admitted was 26.0%, an improvement on the previous season (20.8%), and it maintains a trend that began in 2011-2012. The number of LTCFs that reported having a staff vaccination policy during 2015-2016 was 18.0%, an improvement on the 8.9% reported during 2014-2015.

Target uptake

Overall, the average uptake of the seasonal influenza vaccine among HCWs in both hospitals and LTCFs in 2015-2016 fell substantially short of the 40% target. Participation by hospitals was very high, but the low participation of LTCFs is also of concern as these units care for extremely vulnerable populations and outbreaks among these settings spread rapidly and have been related to high influenza morbidity and mortality in some years. Whether non-participation of many LTCFs reflects a lack of information systems to collect and report on vaccine uptake or other non-specified reasons is not known to HPSC, but further work is needed to identify reasons for non-participation and efforts made to support LTCFs in collating and reporting this data.

The lack of substantial difference in the average uptake among hospital–based HCWs (22.5%) compared to those in LTCFs (26.6%) occurs against different organisational structures for vaccination in these services. Unlike many LTCFs, most hospitals have formal occupational health services available to hospital staff; however this has not translated into overall better coverage in hospital staff. With some notable exceptions the lack of progress in this area may reflect either a lack of awareness, lack of resources or lack of acceptance of vaccination.[1]

According to the World Health Organization annual vaccination is especially important for people at higher risk of serious influenza complications, and for people who live with or care for high risk individuals.[2] In order to reach

2 One of the 101 LTCFs that participated in the 2015-2016 survey did not provide complete information on resident uptake details

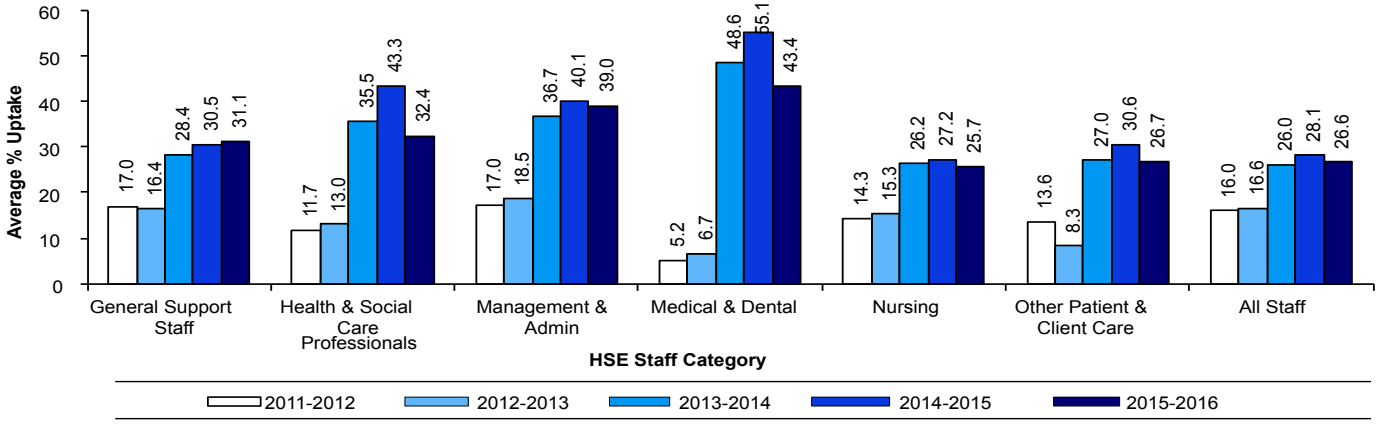

Figure 4. LTCF staff uptake by HSE grade category by season

a national HSE target of 40% vaccination uptake among HCWs, more action is required if unnecessary disease and mortality is to be prevented.

Other countries have already achieved uptake rates well above our target. For example, in England vaccination uptake among those HCWs with direct patient contact is monitored (compared to Ireland where uptake among all HCWs is monitored). During the 2015-2016 season, influenza vaccine uptake among frontline HCWs was 50.6%, a decline of 4.3% from 54.9 % for the previous season.[3] In the United States, the Centre for Disease Control and Prevention analysed data from an internet panel survey of HCWs conducted from October 29–November 13, 2015. Early season 2015-2016 influenza vaccination coverage among HCWs was 66.7%, similar to the 64.3% coverage reported by early season 2014-2015. Vaccination coverage among HCWs was found to be highest in hospitals (83.9%) and lowest in LTCFs (52.4%). In the same study, influenza vaccination coverage was found to be higher among HCWs whose employers required (87.2%) or recommended (61.9%) vaccination compared to 39.4% of HCWs who did not[4]. Reports on uptake levels in the US[4] and from the UK[3] among hospital HCWs clearly indicate that they are substantially higher generally than in Ireland. Furthermore, a policy of vaccination as a mandatory employment requirement in some health care institutions in the US[4] would appear to account for a marked difference with uptake levels reported in the UK where vaccination is currently only recommended for front-line HCWs[5] and also for HCWs generally in Ireland where the uptake levels are lower still.

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2015

ANNUAL
EPIDEMIOLOGICAL
REPORT

09

HEALTHCARE-ASSOCIATED INFECTIONS
ANTIMICROBIAL CONSUMPTION
ANTIMICROBIAL RESISTANCE

9.1 *Clostridium difficile* Infection

Key Points

- In 2015, 1,943 cases of *Clostridium difficile* infection (CDI) were notified. Of those, 1,647 (85%) were classified as new cases, 192 (10%) as recurrent, with 104 (5%) of unknown case type. This represents a national crude incidence rate (CIR) for new and recurrent CDI combined of 42.3 cases per 100,000 population, an increase of 3.8% compared to the rate reported in 2014 (38.5)
- Of the 1,943 CDI cases, 1,323 (68%) were reported from patients aged 65 years or older
- For the first time since it was established in 2009, there were slightly more CDI cases reported to the voluntary enhanced CDI surveillance scheme than were notified to Public Health Departments. Enhanced data was received on 1,955 CDI cases from 54 hospitals. Of those, 1,221 (62%) were healthcare-associated, representing a national CDI incidence rate for new and recurrent healthcare-associated CDI combined of 2.5 cases per 10,000 bed days used for 2015, an increase from 2.3 in 2014
- Data collected on patient location at symptom onset highlights that CDI is not confined to acute healthcare facilities. It is commonly encountered in long term care facilities (9% of all CDI) and in the community (34% of all CDI)
- Of 219 *C. difficile* isolates with available ribotyping data (11% of all cases) reported from 20 hospitals, the most frequent ribotypes reported in 2015 were: 078 (n=33, 15%), 005 and 014 (both n=18, 8%), and 002 (n=14, 6%)

Notifiable *C. difficile* infection

In May 2008, new cases of CDI in persons two years or older became notifiable in Ireland under the disease category "acute infectious gastroenteritis" (AIG). Since January 2012, CDI has become a notifiable infection in its own category, with both new and recurrent CDI cases now notifiable.
In 2015, 1,943 cases of CDI were notified to Public Health Departments via the Computerised Infectious Diseases Reporting (CIDR) system. Of those, 1,647 (85%) were classified as new, 192 (10%) as recurrent, with 104 (5%) of unknown case type. All cases were laboratory-confirmed. Taking both new and recurrent cases into account, the overall CIR for 2015 was 42.3 per 100,000 population, which is higher than the reported rate in 2014 (38.5). At 35.9 per 100,000 population, the national CIR of new CDI cases in 2015 was a slight increase of 0.8% from 35.1 per 100,000 population in 2014.

Since surveillance began in 2008, there has been a decrease in the incidence of CDI in Ireland (**Figure 1**). Since 2012, the CDI incidence rate has remained stable. There was a slight increase in the number of recurrent cases notified in 2015 (n=192) compared to 2014 (n=155). Identification of seasonal patterns from CIDR notification data is hindered by delayed and batched laboratory notifications.

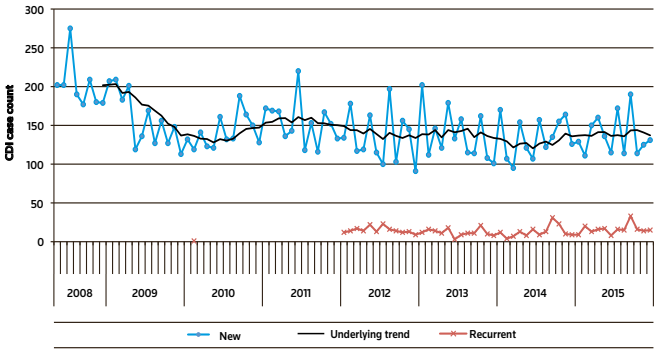


Figure 1. Numbers of CDI notifications by month and case type (2008 – 2015)

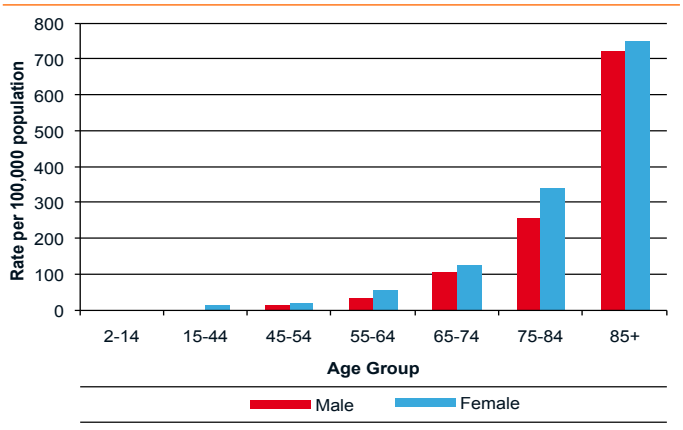
Figure 2 displays the gender and age breakdown of patients with CDI. The majority were female (62%). The mean age was 67 years (range: 2 – 102), with 1,323 cases (68%) reported in patients aged 65 years and older.

Regarding patient location at the time of CDI diagnosis, most were classified as 'hospitalised' (69%), with 14% from general practice, 6% from the emergency department, 4% from outpatients or day patients and 7% from either 'other', or 'unknown' patient location. This is similar to that reported in 2014. However, notifiable CDI data does not provide information on the origin or onset of CDI, as that information is collected as part of the enhanced CDI surveillance scheme.

In 2015, 35 deaths were reported in patients with CDI, which is higher than that reported in 2014 (n=22). Of those, 28 deaths were deemed not attributed to CDI, for six cases the contribution of CDI to death was unknown and one death was attributed to CDI.

Notifiable *C. difficile* infection: Outbreaks

In 2015, 12 CDI outbreaks, 11 of which were healthcare-associated and involving 42 patients, were notified to Public Health Departments, as displayed in **Table 1**. Nine were linked to hospitals, two to nursing homes, and one specified as "other".



* Rates calculated using 2011 census data

Figure 2. Age and gender distribution of CDI in Ireland, 2015 (Source: CIDR)

Table 1. CDI outbreaks reported in Ireland in 2015 by public health region (Source: CIDR)

Public Health Region	Outbreak location	Total number ill
East	Hospital	2
East	Hospital	2
East	Hospital	-
East	Nursing home	6
East	Other	3
MWHB	Hospital	4
NEHB	Comm. Hosp/Long-stay unit	3
NEHB	Hospital	5
WHB	Hospital	3
WHB	Hospital	3
WHB	Hospital	3
WHB	Hospital	8

Enhanced surveillance of *C. difficile* infection

Although notifiable CDI data provides important preliminary information on the burden of CDI in Ireland, it does not capture information on the origin, onset or severity of CDI. National *C. difficile* enhanced surveillance commenced on a voluntary basis on 1st August 2009. Information on case type, origin, onset and infection severity is collected using the European Society for Clinical Microbiology and Infectious Diseases Study Group on *C. difficile* (ESCMID-ESGCD) interim case definitions. To the end of 2015, 54 acute hospitals participated in enhanced CDI surveillance, comprising 45 public hospitals [94% of all public hospitals: 27 general (100%), nine tertiary (100%) and nine specialist (75%)] and nine private hospitals (75%).

In 2015, 1,955 CDI cases were reported to the enhanced surveillance scheme. Of those, 1,667 (85%) were classified as new, 208 (11%) as recurrent and 80 (4%) of unknown CDI case type.

Of the reported cases, 62% (n=1,221) originated within the reporting healthcare facility. The CDI rate is based on the number of new and recurrent CDI cases that originated in the participating healthcare facility (both public and private hospitals). The rate is calculated using acute public

Table 2. Origin and onset of CDI, 2013 – 2015

	Year		
	2013	2014	2015
	%	%	%
ORIGIN: Location of where infection was acquired			
Healthcare-associated	64	64	62
Hospital	49	48	47
NH/LTCF	11	11	9
Other	4	5	6
Community-associated	18	18	22
Indeterminate	5	5	6
Unknown	13	13	10
ONSET: Location of where patient symptoms occurred			
Healthcare-onset	61	59	59
Hospital	45	44	45
NH/LTCF	11	11	9
Other	4	4	5
Community-onset	29	34	34
Unknown	11	7	7

hospital activity data from the HSE Business Intelligence Unit, with private hospital activity data provided directly by participating hospitals. The overall national CDI incidence rate of new and recurrent healthcare-associated CDI cases combined was 2.5 cases per 10,000 bed days used (BDU), an increase from 2.3 in 2014. The incidence rate of new CDI was 2.3 cases per 10,000 BDU, an increase from 2.1 in 2014. The incidence of recurrent cases also increased to 0.3 cases per 10,000 BDU from 0.2 in 2014.

Since enhanced surveillance began, the national annual combined new and recurrent CDI rate declined from 3.1 cases per 10,000 BDU (2009) to the lowest recorded rate of 2.3 (2014), followed by an increase to 2.5 in 2015 (**Figure 3**).

Caution should be taken when interpreting national CDI trends, particularly prior to 2012 due to:

(i) Changes in the numbers of participating hospitals, as displayed in **Figure 3.** Throughout 2012, the total number of hospitals participating in enhanced CDI surveillance stabilised. Since 2012, there has been a complete participation in CDI enhanced surveillance by all tertiary and general hospitals

(ii) Changes in *C. difficile* laboratory testing protocols: From 2013 to 2015, there were fewer changes in laboratory testing protocols. Please also refer to the section on laboratory testing of *C. difficile* in Ireland

There was a wide range in the incidence of CDI among participating hospitals in 2015 (range, 0 – 4.9 cases per 10,000 BDU; median = 1.8). In 2015, tertiary hospitals (n = 9) had a median CDI rate of 3.2 cases per 10,000 BDUs (range: 1.9 – 4.1), which was higher when compared to that of general hospitals (n = 27), with a median rate of 1.0 (range: 0 – 4.5). Since 2011, the median CDI rate in general hospitals declined from 2.4 to 1.0. However, for tertiary hospitals, 2015 marked the first increase in median CDI rate since 2010.

The differences in CDI median incidence rates may reflect inter-hospital variation with regard to patient case mix, *C. difficile* ribotypes, laboratory testing protocols, antimicrobial prescribing policies, antimicrobial stewardship interventions, infrastructure and access to *en suite* isolation rooms and surveillance resources. No obvious seasonal trend for CDI is distinguishable from enhanced surveillance data in 2015.

The percentage coverage of acute hospital activity was calculated using bed days used data from participating hospitals as a percentage of total acute hospital bed days used activity in Ireland

Severe CDI

A severe case of CDI is defined as (i) a patient requiring admission to an intensive care unit (ICU) for treatment of CDI or its complications, (ii) a patient requiring colectomy or (iii) death within 30 days after diagnosis, if CDI is either the primary or contributory cause of death. The enhanced CDI surveillance scheme does not collect information on patient outcome. Therefore, surgery and ICU admission for CDI are the two markers of severity captured via enhanced surveillance. In 2015, 30 (1.5%) severe CDI cases were reported, similar to 2014 (1.4%). One patient required both surgery and ICU admission, five required surgery only and 24 required ICU admission without surgery.

Onset & Origin of CDI

Onset: Patient location when symptoms of CDI commenced

Fifty-nine percent (n=1,159) of patients had CDI symptom onset in a healthcare facility (healthcare-onset), 34% (n=669) had symptom onset in the community and for 7% (n=127), location at CDI onset was unknown (**Table 2**).

Of the 1,159 patients with healthcare onset CDI, 76% (n=876) had onset in the reporting hospital, 4% (n=52) in another hospital, 16% (n=183) in a long term care facility (LTCF) and for the remaining 4% (n=48) onset location was unknown. Between 2013 and 2015, there was a decrease in the proportion of patients with CDI symptom onset in a healthcare facility (61 to 59%). Community onset increased from 29% to 34% between 2013 and 2014, where it remained unchanged in 2015 (**Table 2**).

Origin: Location where the patient acquired the CDI

For the majority of CDI cases, the infection was acquired in a healthcare setting (healthcare-associated) (n=1,221; 62%). Community-associated cases accounted for 22% (n=420) and in 6% (n=123) the origin was indeterminate and could not be assigned as either healthcare or community-associated, as the patient had been discharged from a healthcare facility between four and 12 weeks prior to the CDI onset date. For the remaining 10% (n=191) of cases, the origin was unknown (**Table 2**).

Table 3. National reporting of C. difficile ribotyping data: 2011 - 2015

Year	Total number of CDI cases reported	Number (%) of cases with ribotype data	Number of hospitals providing ribotype data
2011	1511	211 (14%)	10
2012	1735	263 (15%)	14
2013	1801	258 (14%)	19
2014	1780	290 (16%)	20
2015	1955	219(11%)	22

Of the 1,221 healthcare-associated CDI cases, 76% (n=928) originated in the reporting hospital, 7% (n=83) originated in a hospital other than the reporting hospital, 14% (n=173) originated in a LTCF and 3% (n=37) originated in another unspecified healthcare facility or were of unknown origin.

Between 2013 and 2015, there was a small decrease in the proportion of cases associated with a healthcare facility (64 to 62%), which was demonstrated in the reporting hospital, as well as LTCF. The proportion of cases associated with the community increased from 18% to 22%, and there was slight increase in cases classified as indeterminate (from 5% to 6%). Cases classified as 'unknown' decreased from 13% to 10% between 2014 and 2015 (**Table 2**).

Of the 1,221 cases of healthcare-associated CDI:

- 87.5% (n=1,068) experienced onset of CDI symptoms at least 48 hours following admission to a healthcare facility (healthcare-onset, healthcare-associated)
- 12% (n=147) experienced symptom onset in the community, within four weeks of discharge from a healthcare facility (community-onset, healthcare-associated)
- 0.5% (n=6) had no information recorded on symptom onset

Of the 420 cases of community-associated CDI:

- 93% (n=389) experienced CDI symptom onset while outside a healthcare facility and without a history of discharge from a healthcare facility within the previous 12 weeks (community- onset, community-associated)
- admission to or residence in a healthcare facility within the previous 12 weeks (healthcare-onset, community-associated)

Information was also captured on the location where the patient's faeces specimen was taken. The reporting hospital accounted for the majority (76%) of specimens (n=1,490), with 12% (n=225) taken in the GP surgery, 8% (n=156) in LTCF and 3% (n=65) in a hospital other than the reporting hospital. For the remaining 1% (n=19), no information was provided.

Discussion

The collation of national data on *C. difficile* through CIDR notifications and the enhanced CDI surveillance system has provided a valuable insight into the burden of CDI in Ireland. Both surveillance systems present a similar decreasing trend since 2009. The notifiable surveillance system, which reflects total burden of disease, shows that the CDI rate stabilised between 2012 and 2015, while the enhanced surveillance system shows a decrease in the CDI rate between 2012 and 2014, but a slight increase in 2015. For the first time in 2015, cases reported to enhanced CDI surveillance exceeded those notified to public health departments.

In 2015, recurrent CDI accounted for 11% of notifications through the enhanced surveillance scheme, which is an increase from 8% in 2014. Recurrent CDI may result in severe infection, which places a further burden on limited hospital isolation resources and results in significant patient morbidity.

CDI is not confined to acute healthcare settings and is increasingly common in LTCF and the community. In 2015, 9% of cases had onset in LTCF, with 34% having onset in the community. Of the 420 community-associated cases reported in 2015, 93% experienced CDI symptom onset in the community, without a history of discharge from a healthcare facility within the previous 12 weeks. It is important to consider CDI in the differential diagnosis of all patients presenting with diarrhoea of potentially infectious origin, regardless of patient location and to send a faeces specimen in a timely fashion for laboratory diagnosis, which should routinely include testing for *C. difficile* in patients aged over two years, in keeping with national CDI guidelines.

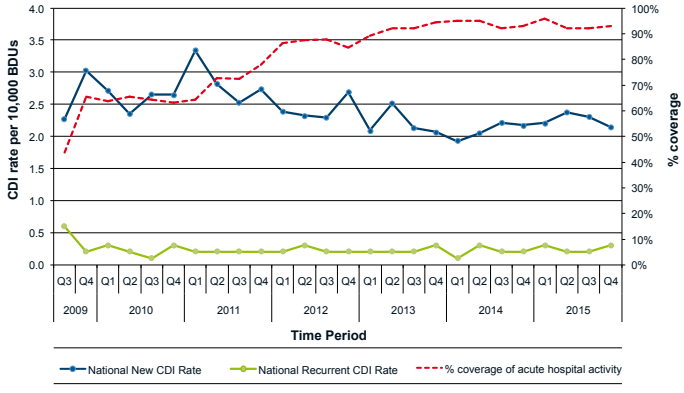


Figure 3. Quarterly national rate of healthcare-associated CDI (new and recurrent): 2009 – 2015

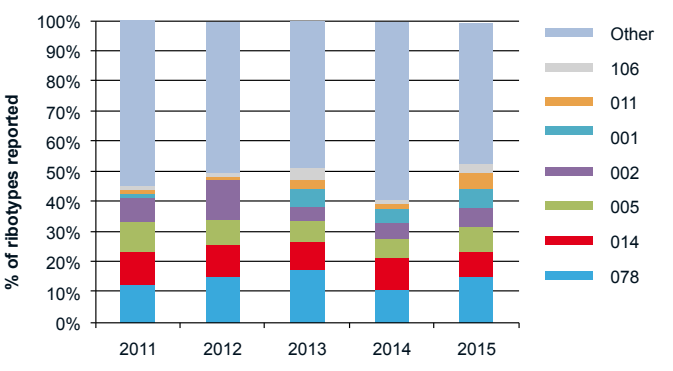


Figure 4. Most frequently reported C. difficile ribotypes in Ireland: 2010 – 2015

C. difficile PCR ribotyping

As part of the voluntary *C. difficile* enhanced surveillance scheme, participating hospitals are requested to provide *C. difficile* PCR ribotyping information, where available. Ireland does not yet have a national *C. difficile* reference laboratory or ribotyping service. Therefore, laboratories submit specimens abroad for ribotyping. In 2015, ribotyping data was provided for 219 *C. difficile* isolates (11% of all samples) from 20 hospitals (**Table 3)**. The most frequent ribotypes reported in 2015 were: 078 (n=33, 15%), 005 and 014 (both n=18, 8%), and 002 (n=14, 6%) (**Figure 4**).

Laboratory Testing of *C. difficile* in Ireland

Since 2010, information on *C. difficile* testing has been collected quarterly as part of the enhanced surveillance system. In Q1 2010, the majority of hospitals participating in the enhanced surveillance project were using a one-step Toxin EIA (60%). By Q4 2015, this had reduced to 0%. All hospitals participating in the enhanced surveillance system are now using a method which complies with recommendations in the 2014 update of the 2008 Irish *C. difficile* guidelines. This includes either a PCR test for detection of toxin genes (43%, n=23) or a two-step testing method (57%, n=30) (**Figure 5**). Owing to variations in current Irish laboratory *C. difficile* testing methodologies, inter-hospital comparison of CDI rates is not recommended where testing methods differ, as the data in the national quarterly enhanced surveillance reports are not adjusted for differences in the sensitivities of the different diagnostic methodologies.

Conclusion

The continued excellent participation in the voluntary CDI enhanced surveillance scheme ensures that a significant amount of information is collected regarding the burden of CDI in Ireland. The National Clinical Guidelines on the Surveillance, Diagnosis and Management of CDI in Ireland were updated in 2013 and endorsed by the National Clinical Effectiveness Committee in 2014. The updated guidelines may be accessed on the HPSC website at: http://www.hpsc.ie/A-Z/Gastroenteric/Clostridiumdifficile/Guidelines/.

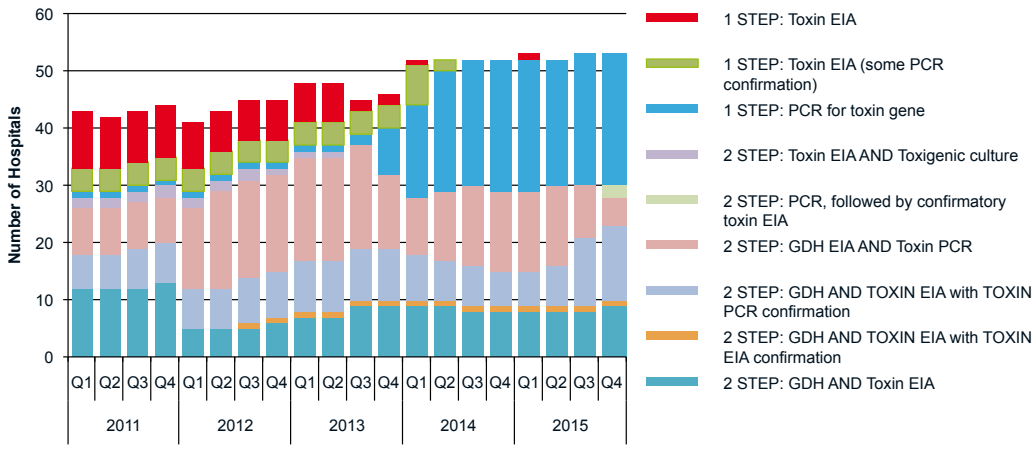


Figure 5. Changes in C. difficile laboratory testing protocols: 2011 - 2015

1 STEP: Toxin EIA: EIA for the detection of *C. difficile* TcdA and/or TcdB. **1 STEP: PCR for toxin gene:** Polymerase chain reaction (PCR) for the detection of TcdA and/or TcdB genes; **2 STEP: GDH AND TOXIN EIA:** Enzyme immunoassay (EIA) for the detection of glutamate dehydrogenase (GDH) of *C. difficile* as well as or followed by an EIA for the detection of *C. difficile* TcdA and/or TcdB.; **2 STEP: GDH EIA AND Toxin PCR:** EIA for the detection of GDH of *C. difficile* as a first screening test, followed by PCR for the detection of TcdA and/or TcdB genes;

9.2 Alcohol Hand Rub Surveillance

Summary

Key Points

- In 2015, the median rate of alcohol-based hand rub consumption in acute hospitals in Ireland increased by 14% to 31.6 litres per 1,000 bed-days used versus 27.7 in 2014

Hand hygiene is one of the most important actions to prevent HCAI. Alcohol-based hand rubs (ABHR) are an effective and rapid method of hand hygiene and recommended as the primary means of hand hygiene in national and international guidelines. Measurement of hospital-level ABHR consumption, inclusive of gel and foam formulations, is expressed as volume in litres (L) per 1,000 bed days used (BDU). ABHR consumption is a recommended process measure of hand hygiene activity by both the World Health Organization (WHO) and the US Centers for Disease Control & Prevention (CDC).

HPSC has collated data on ABHR consumption in acute public hospitals in Ireland since 2006. The data are collected quarterly. For hospitals that provide the data via their pharmacy department, it represents the total volume of ABHR dispensed to wards, clinics and other hospital areas. For hospitals that provide the data via their supplies department, it represents the total volume of ABHR purchased by the facility. Quantities used for pre-operative surgical hand hygiene were excluded. The rate of usage per hospital is calculated as the total volume of ABHR consumed in litres (L) per 1,000 BDU (Table 1).

In 2015, the median rate of ABHR consumption increased by 14% from 27.7L/1,000 BDU in 2014 to 31.6. The wide variation in levels of ABHR consumption between hospitals (10.1 – 96.8), although not as wide as in past years, may be explained by differences in local methodologies for collecting and reporting the data, along with difference in types and range of hand hygiene agents used. One limitation of this surveillance system is that the data refer to the use of ABHR only, and do not take account of the other hand hygiene agents (e.g. medicated liquid soap) that may also be in use in hospitals. In addition, the data do not give an indication of the frequency with which hand decontamination is carried out at a given hospital, whether or not hand hygiene is carried out at the correct time or using the correct technique, nor distinguish between who has used the ABHR (visitor, patient or healthcare worker). Nevertheless, given that ABHR should be used for the vast majority of hand hygiene opportunities in hospital settings, ABHR consumption remains a useful process measure for hand hygiene activity.

In 2015, the total number of hospitals participating in ABHR surveillance decreased to 39 versus 43 in 2014. The main reason was reorganisation of data provided by a particular region from individual hospital sites to a format that aggregates into a small numbers of groups by directorates. In addition, data from one hospital could not be provided due to staffing issues.

The data are prone to reporting artefacts, particularly for hospitals that report supplies (rather than pharmacy dispensing) data. For example, the hospital with the highest reported rate in past years had undergone a change in suppliers and the products had been restocked in all areas of the hospital over a relatively short period of time. It is expected that there will be occasional outliers of this nature. Using the median consumption figure provides a stable indicator of the national ABHR rate over time. However, the volume of ABHR consumed remains a crude measure of hand hygiene activity at individual hospital level and must be viewed in conjunction with other indicators, such as direct observation of hand hygiene compliance.

Further information may be found at:
http://www.hpsc.ie/A-Z/Gastroenteric/Handwashing

Table 1. Annual national data on ABHR consumption in acute public hospitals in Ireland: 2006 – 2015.

	Number of participating hospitals	National consumption rate*	Range for participating hospitals
2006	52	10	0.5 - 29.0
2007	50	15	5.2 - 47.1
2008	50	18.1	5.9 - 67.0
2009	49	20.3	4.1 - 47.7
2010	45	18.8	4.2 - 36.4
2011	43	21.3	10.9 - 130.0
2012	44	23.8	9.6 - 160.0
2013	44	26.3	16.4 - 132.5
2014	43	27.7	4.3 - 72.1
2015	39	31.6	10.1 - 96.8

* The consumption rate is the total volume of ABHR consumed in the defined time period in litres per 1,000 bed-days used. The national rate represents the median of the national sample for each time period.

9.3 Hand Hygiene Compliance

Summary

- On a background of on-going hand hygiene compliance audits in acute hospitals, national data were collated and reported for two audit periods during 2015
- For Period 9 (May/June), 51 hospitals participated [HSE; 44 and private; 7]. In total, 10,667 opportunities for hand hygiene were observed; achieving an average compliance of 88.4% (range = 75.2 - 96.7)
- For Period 10 (October/November), 52 hospitals participated [HSE; 44 and private; 8]. In total, 10,890 opportunities for hand hygiene were observed; achieving an average compliance of 89.5% (range = 78.6 - 96.7)
- While the overall compliance of 88.6% for the combined periods for HSE hospitals fell short of the HSE target of 90% for 2015 the underlying trend in compliance has increased. Compliance for participating private hospitals for the combined periods was 91.4%

Hand hygiene is one the most important actions to prevent HCAI. Measuring hand hygiene compliance by direct observation is described by the World Health Organization (WHO) as the gold standard. In Ireland, public reporting of biannual hand hygiene compliance audit data from acute hospitals commenced in 2011. Healthcare workers (HCWs) are observed for their compliance against the '5 moments of hand hygiene' by trained auditors using the WHO methodology for hand hygiene audits. Each hospital is required to measure HCW compliance against 30 hand hygiene opportunities for each of the seven randomly selected wards in the facility, resulting in a maximum of 210 opportunities per hospital per period. In 2013, the analysis and management of data were moved to the HPSC online service, MicroB.

Biannual audits were undertaken in May/June (Period 9) and October/November 2015 (Period 10). In total, 10,667 opportunities for hand hygiene were observed for Period 9; achieving an average compliance of 88.1% (range = 75.2 - 96.7). For Period 10, 10,890 opportunities for hand hygiene were observed; achieving an average compliance of 89.5% (range = 78.6% - 96.7).

Table 1: Summary of hand hygiene compliance in acute hospitals in Ireland combined for the two national audit periods in 2015.
Note that data from private hospitals were excluded for the Staff Categories and WHO 5 Moments sections.

	Hand Hygiene Opportunities	Hand Hygiene Actions	Percent Compliance	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Overall	21,557	19,183	89.0%	88.5%	89.4%
HSE Hospitals	18,413	16,308	88.6%	88.1%	89.1%
Private Hospitals	3,144	2,875	91.4%	90.4%	92.5%
HSE - South	6,297	5,620	89.2%	88.4%	90.1%
HSE - Dublin North-East	3,770	3,232	85.7%	84.5%	86.9%
HSE - Dublin Mid-Leinster	4,193	3,791	90.4%	89.5%	91.3%
HSE - West	4,153	3,665	88.2%	87.2%	89.3%
Nurse/Midwife	10,538	9,647	91.5%	91.0%	92.1%
Auxiliary	2,995	2,626	87.7%	86.4%	88.9%
Medical	3,444	2,721	79.0%	77.5%	80.5%
Allied health/Other	1,436	1,314	91.5%	90.0%	93.0%
Moment 1	4,809	4,327	90.0%	89.1%	90.9%
Moment 2	867	742	85.6%	83.1%	88.1%
Moment 3	1,451	1,322	91.1%	89.6%	92.6%
Moment 4	6,424	5,851	91.1%	90.3%	91.8%
Moment 5	5,629	4,777	84.9%	83.8%	85.9%

Staff category: 'Auxiliary' includes healthcare assistants, porters, catering and household services; 'Allied health/Other' includes physiotherapists, radiologists, dieticians, social workers and pharmacists

Moment 1: Before touching a patient; Moment 2: Before clean/aseptic procedure; Moment 3: After body fluid exposure risk; Moment 4: After touching a patient; Moment 5: After touching patient surroundings

Results for the two periods are combined in a summary in Table 1 and Figure 1. In 2015, the overall compliance for HSE and private hospitals combined was 89.0%. At 88.6%, compliance for HSE hospitals fell short of the target of 90%. The underlying trend for compliance among HSE hospitals has increased (Figure 2). Participating private hospitals reported an overall compliance of 91.4% in 2015.

In 2015, of the four major HCW categories, medical staff had the lowest compliance at 79%, 'Auxiliary' which includes healthcare assistants had a compliance of 87.7% and both nurse/midwife and 'Allied health/Other' staff category which includes physiotherapists, radiologists, dieticians, social workers and pharmacists had the highest at 91.5%.

Based on the WHO '5 moments for hand hygiene', compliance for moment 5 (after touching patient surroundings) was the lowest at 84.9% and the highest for moment 3 (after body fluid exposure risk) at 91.1%. The proportion of hand hygiene actions that were undertaken using soap and water was 26.4%, versus alcohol-based hand rub which accounted for 73.6% of hand hygiene actions. Data from private hospitals were excluded from analysis by staff categories and by WHO 5 Moments in Table 1 and Figure 1.

Limitations of current methodology

- While standardised hand hygiene auditor training and validation (with inter-rater reliability testing) should ensure that measurement of hand hygiene is comparable, these results have not been validated by external auditors
- All auditors measured hand hygiene compliance in the facility in which they work. Therefore, there may be an element of bias in the results
- It is possible that hand hygiene auditing may not have been performed in a comparable fashion in all hospitals and these results may not reflect HCW compliance at all times

Compliance with hand hygiene is measured by auditors observing HCW undertaking patient care and who may change their behaviour if aware that they are being observed. However, it is also known that this effect (known as the Hawthorne effect) diminishes over time and HCWs under observation may not be aware of the presence of the auditor due to the many competing demands on their attention. Auditors are requested to give immediate feedback to ward staff following an audit, thereby increasing awareness and knowledge of hand hygiene. This risk of bias should be balanced by the benefits of increasing local staff's knowledge and awareness of hand hygiene.

Staff category: "Auxiliary" includes healthcare assistants, porter, catering and household services; "Allied health/Other" includes physiotherapists, radiologists, dieticians, social workers and pharmacists
Moment 1: Before touching a patient;
Moment 2: Before clean/aseptic procedure;
Moment 3: After body fluid exposure risk;
Moment 4: After touching a patient;
Moment 5: After touching patient surroundings

Figure 1: Summary of hand hygiene compliance in acute hospitals in Ireland combined for the two national audit periods in 2015. The 95% confidence intervals are shown in bars and the HSE target for 2015 (90%) is shown as a red line.
Note that data from private hospitals were excluded for the Staff Categories and WHO 5 Moments.

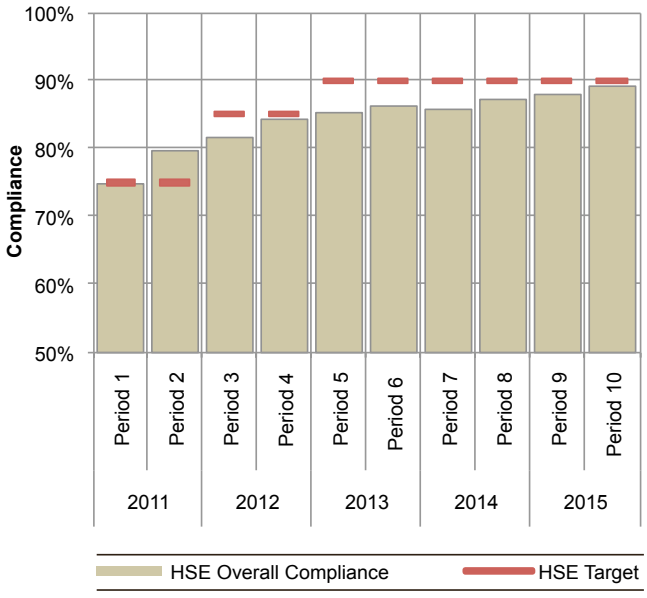


Figure 2: Summary of hand hygiene compliance in HSE acute hospitals in Ireland for the last eight national audit periods, 2011 to 2015. The HSE target for each year is shown as red lines.

9.4 Antimicrobial Consumption

Key Points

- The overall outpatient antimicrobial consumption in Ireland for 2015 was 23.6 defined daily doses (DDD) per 1000 inhabitants per day (DID), a 7% increase on the 2014 rate of 23.9 DID. This rate is mid-to-high in comparison with other European countries
- The median rate of hospital antimicrobial consumption in Ireland for 2015 was 82.6 DDD per 100 bed days used (DBD) (range = 29.3 – 108.7), a 0.7% increase on 2014. This rate is mid-range in comparison with other European countries. In 2015, 42 acute public hospitals contributed data

Ireland participates in ECDC's European Surveillance of Antimicrobial Consumption Network (ESAC-Net), which aims to collect systemic antimicrobial usage data from the outpatient (ambulatory, community or primary care) setting and from the hospital (inpatient) setting. Antimicrobial consumption is measured in defined daily dose (DDD), which is the assumed average maintenance dose per day for a drug used for its main indication in adults. Rates are calculated in DDD per 1000 inhabitants per day (DID) for outpatients and DDD per 100 bed-days used (DBD) for inpatients. Please refer to "Antimicrobial consumption" and "Denominator data" parts of the explanatory notes section for further details.

Outpatient Antimicrobial Consumption

The overall outpatient antimicrobial consumption for Ireland in 2015 was 25.6 DID, an increase of 7% on the 2014 rate of 23.9 DID. In the latest ESAC-Net report (2015 data), the reported range of outpatient J01 (antibacterial agents for systemic use) antimicrobial usage among European countries was 10.7 to 36.1 DID; the median for 30 European countries with reliable data was 20.7 DID, with Ireland ranking as the ninth highest.

The underlying trend for outpatient antimicrobial consumption for Ireland (Figure 1) has been increasing steadily since 2000. After a decrease in 2008 and 2009, the rate increased again to the highest level so far in quarter 4 2015. There is a marked seasonal fluctuation in usage, with the highest consumption contemporaneous with periods of increased influenza activity.

In 2015, outpatient consumption of penicillins accounted for the largest class used (61% of total at 15.5 DID), followed by macrolides (17%, 4.2 DID), tetracyclines (10%, 2.6 DID), cephalosporins (5%, 1.2 DID), sulphonamides/trimethoprim (4%, 1.1 DID) and fluoroquinolones (4%, 0.9 DID). Penicillin in combination with a beta-lactamase inhibitor (such as co-amoxiclav) accounted for the largest proportion of all penicillins at 44% (6.8 DID). Broad-spectrum penicillin (such as amoxicillin) usage was also high at 35% of all penicillins (5.4 DID). See Table 1 for a detailed breakdown by pharmacological drug groups.

There was considerable variability in the overall outpatient antimicrobial usage at county level (19.2 to 35.4 DID), as shown in Figure 2.

Hospital Antimicrobial Consumption

Forty-two acute public hospitals provided valid antimicrobial usage data for 2015. The median rate of antimicrobial consumption was 82.6 DBD (range 29.3 – 108.7 DBD). This was a 0.7% increase from 2014's median rate on 82.0 DBD. The overall rate for 2015 was 84.0 DBD. These levels are mid-to-high in Europe.

The largest group of antimicrobials, penicillins at 41.2 DBD accounted for 48% of all inpatient antimicrobial usage. The use of fluoroquinolones such as ciprofloxacin (representing 6% of all inpatient antimicrobial usage) was 5.3 DBD. Consumption of cephalosporins, monobactams and carbapenems (representing 10% of all inpatient antimicrobial usage) was 8.7 DBD. Consumption of glycopeptides such as intravenous vancomycin, imidazoles such as intravenous metronidazole and nitrofurans (representing 10% of all inpatient antimicrobial usage) was 8.2 DBD. Consumption of erythromycin and related agents (macrolides, representing 3% of all inpatient antimicrobial usage) was 2.6 DBD. Less frequently used agents in hospitals are tetracyclines, sulfonamides/trimethoprim,

aminoglycosides and other systemic antimicrobials; collectively these drugs represent just less than 10% of all inpatient antimicrobial usage.

The data do not indicate whether or not the level of antimicrobial use is appropriate for a given patient population. For example, higher levels of antimicrobial consumption among tertiary hospitals may be appropriate if such hospitals have specific patient populations that are more likely to require antimicrobial therapy (e.g. organ transplant, cystic fibrosis etc). Furthermore, DDD calculations are based on adult dosing and may therefore underestimate antimicrobial consumption in paediatric settings.

While antimicrobial consumption data in Ireland are comprehensive, gaps remain. Most notably, data from private hospitals is missing. All hospitals dispense to outpatients, day cases and external long term facilities, and the data representing this volume is excluded from our analyses. Outpatient data represents 95% of wholesale-to-retail pharmacy transactions. Therefore, there is a further gap in the data. Collectively, these gaps would represent about 10% of the total antimicrobial consumption for Ireland. While HPSC provides antifungal consumption data to ESAC-Net, this report is primarily focussed on antibacterial consumption only. ESAC-Net also collects data on antiviral and antiprotozoal agents, which are not currently analysed in Ireland.

Table 1. Breakdown by pharmacological drug groups for outpatient antibiotic use in Ireland for 2014 and 2015.

	2014	Percent of 2014	2015	Percent of 2015	Percent Change 2014 to 2015
Penicillins	13.5	56.4%	15.5	60.6%	14.9%
Narrow spectrum penicillins	1.1	4.4%	1.1	4.1%	0.6%
Beta-lactamase resistant penicillins	1.9	8.0%	2.3	8.9%	19.1%
Broad spectrum penicillins	4.4	18.4%	5.4	21.1%	22.0%
Penicillin with beta-lactamase inhibitor	6.1	25.6%	6.8	26.5%	10.9%
Macrolides and related drugs	4.5	18.8%	4.2	16.5%	-5.6%
Tetracylines	2.8	11.5%	2.6	10.1%	-6.0%
Cephalosporins and other beta-lactam drugs	1.1	4.7%	1.2	4.6%	3.7%
First-generation cephalosporins	0.3	1.1%	0.3	1.1%	10.0%
Second-generation cephalosporins	0.8	3.4%	0.8	3.3%	5.2%
Third-generation cephalosporins	0.1	0.3%	0.0	0.2%	-39.0%
Quinolones	0.9	3.8%	0.9	3.6%	3.0%
Sulfonamides and Trimethoprim	1.0	4.4%	1.1	4.1%	0.8%
Other antibiotics	0.1	0.4%	0.1	0.4%	-1.2%
TOTAL	**23.9**	**100.0%**	**25.6**	**100.0%**	**7.0%**

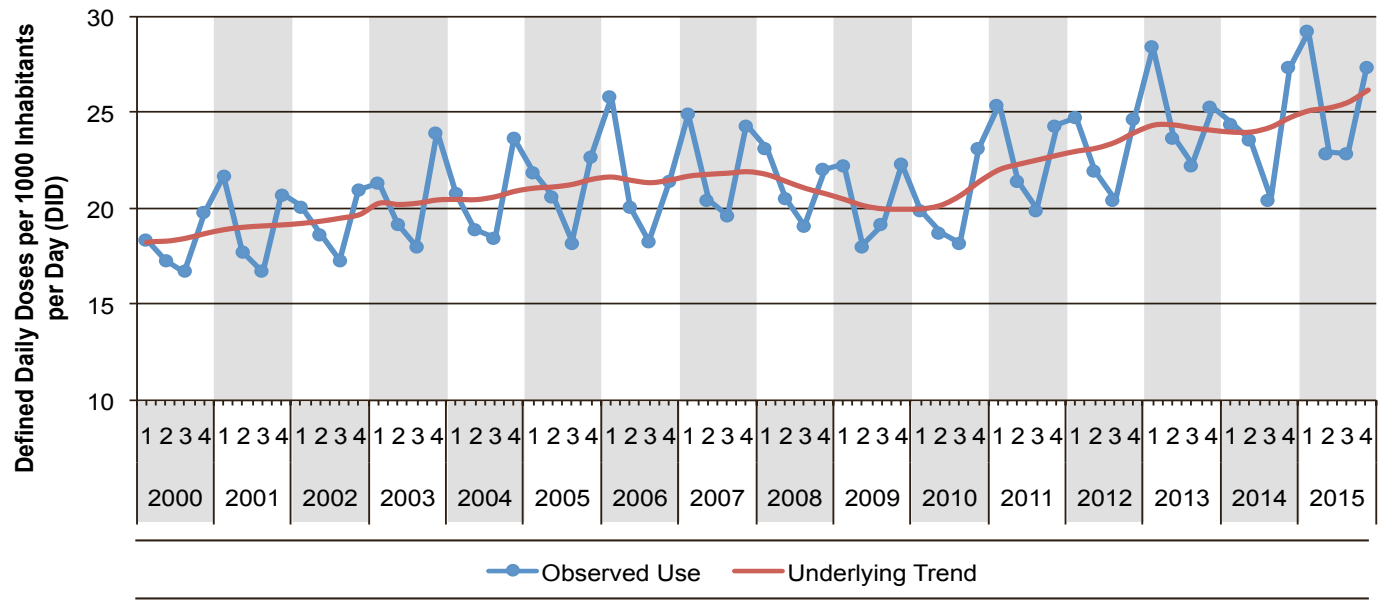


Figure 2. Outpatient antibiotic consumption in Ireland by county, in DDD per 1000 inhabitants per day for 2015.

More detailed analyses of antimicrobial usage data can be found on the www.hpsc.ie website, through "Topics A-Z", under "Antibiotic Consumption Surveillance". Details of the WHO ATC/DDD system of classifying and measuring drug consumption can be found at www.whocc.no/atc_ddd_index/. The figures presented in this report may vary from previously published levels owing to methodological changes.

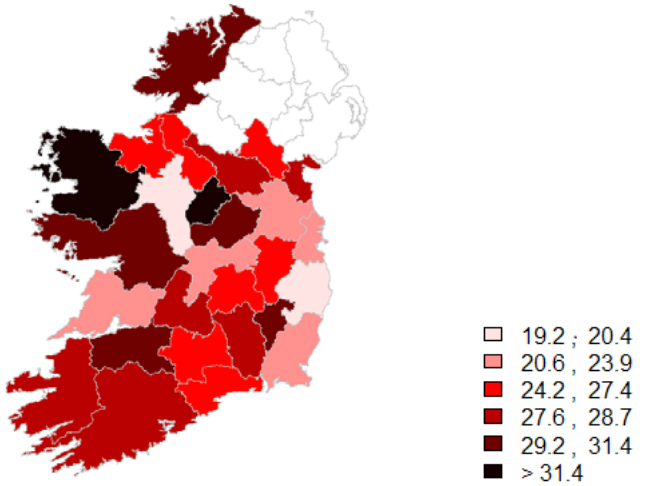


Figure 2. Outpatient antibiotic consumption in Ireland by county, in DDD per 1000 inhabitants per day for 2015.

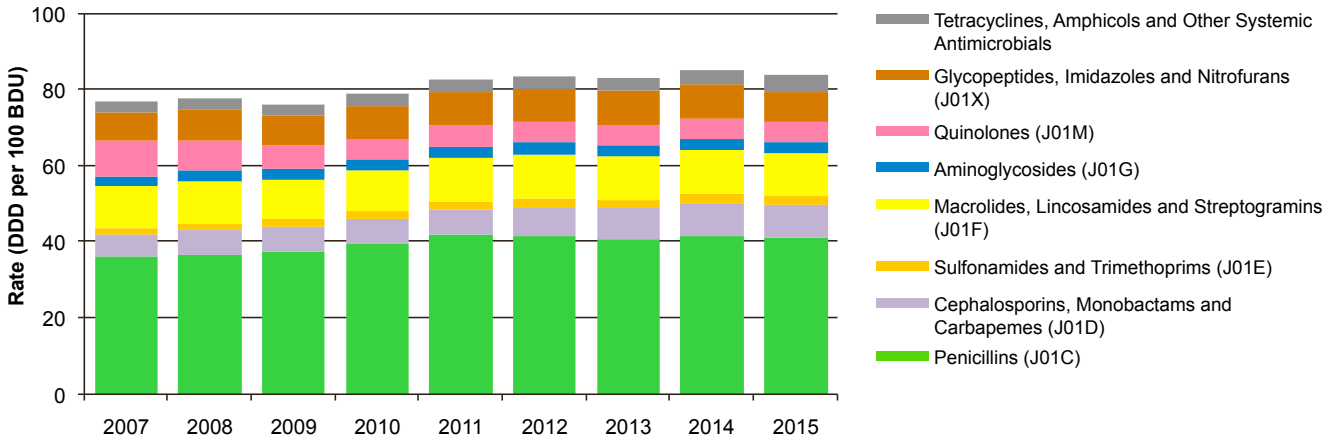


Figure 3. Overall hospital antimicrobial consumption rate in DDD per 100 BDU by pharmacological subgroup (ATC level 3) by year.

9.5 Antimicrobial Resistance

Key Points

- In 2015, there was a slight reduction in coverage of the Irish population by EARS-Net versus 2014, from 100% to 97%

- **There were 2,697 reports of invasive *Escherichia coli* infection:**
  - The proportion resistant to third-generation cephalosporins (3GC) at 12.5% and extended-spectrum beta lactamase (ESBL) producers at 10.6% reached the highest levels to date
  - There were two cases of carbapenemase-producing *E. coli* invasive infection, also known as carbapenem-resistant *Enterobacteriaceae* (CRE)

- **There were 401 reports of *Klebsiella pneumoniae* bloodstream infection (BSI)**, an increase from 358 in 2014:
  - The proportion resistant to 3GCs at 17.5% and ESBL producers at 13.3% increased from 2014 levels; 12.8% and 11.0%, respectively
  - In Ireland, *K. pneumoniae* that are both ESBL-producers and non-susceptible to ciprofloxacin and gentamicin are called multi-drug resistant *K. pneumoniae* (MDRKP). Some also produce carbapenemases. The proportion of invasive *K. pneumoniae* that were MDRKP increased from 8.2% in 2014 to 9.8% in 2015
  - There were seven cases of confirmed carbapenemase-producing *K. pneumoniae* invasive CRE infection

- **There were 201 reports of invasive *Pseudomonas aeruginosa* infection**, an increase from 2014. Resistance to most indicator antimicrobials, except carbapenems, decreased

- **There were 421 reports of *Enterococcus faecium* BSI**, an increase from 2014:
  - The proportion resistant to vancomycin (VREfm) at 45.6%, reflected one of the highest levels to date

- **There were 1,082 reports of *Staphylococcus aureus* BSI:**
  - The proportion that were meticillin-resistant *S. aureus* (MRSA) at 18.4% is the lowest annual proportion reported to date
  - The overall MRSA BSI rate for acute hospitals was 0.050 cases per 1,000 bed days used (BDU), a slight decrease from 0.055 in 2014. The meticillin-susceptible *S. aureus* (MSSA) BSI rate also decreased from 0.227 (2014) to 0.223 (2015)

- **There were 304 reports of invasive *Streptococcus pneumoniae* infection:**
  - The proportion deemed penicillin non-susceptible (PNSP) at 17.5% represented a slight increase from 17.1% in 2014
  - While the national rate of invasive pneumococcal infection at 6.8 per 100,000 population, represented a decrease compared to 7.2 in 2014
  - Serotype data was available for the majority of invasive *S. pneumoniae* isolates (n=276; 90.8%). Results indicate good coverage (67.1%) for the 23-valent pneumococcal polysaccharide vaccine (PPV23) in its target population (adults ≥65 years)

- Enhanced surveillance data were provided on 2,432 records (cases or isolates under the EARS-Net definition) from 22 laboratories, representing 45% of all reported cases in 2015

See http://www.hpsc.ie for further details of EARS-Net, antimicrobial resistance and enhanced BSI surveillance in Ireland

European data are available at: http://ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/database.aspx

Introduction

The European Antimicrobial Resistance Surveillance Network (EARS-Net), previously the European Antimicrobial Resistance Surveillance System (EARSS), collects routinely-generated antimicrobial susceptibility testing data on seven important bacterial pathogens using the EARS-Net case definition. Participating laboratories in Ireland submit data on the "primary" or first isolate from blood or cerebrospinal fluid (CSF) per patient per quarter. EARS-Net does not distinguish clinically significant isolates from contaminants, nor does it distinguish between hospital-acquired, healthcare-associated and community-acquired infections. EARS-Net primarily serves as a surveillance system to measure national levels of antimicrobial resistance (AMR). In 2015, three of the 39 microbiology laboratories suspended their participation in EARS-Net for two quarters each, resulting in an estimated 97% coverage of the Irish population.

Escherichia coli

There were 2,697 reports of invasive *E. coli* infection (blood = 2,689 and CSF = 8) from 2,645 patients, compared with 2,771 reports in 2014. The observed decrease was due to lower population coverage in 2015 (see introduction). **Table 1** displays annual trends since 2008 in the proportion of *E. coli* isolates resistant to the five "indicator" antimicrobials/antimicrobial classes: ampicillin, third-generation cephalosporins (3GC; cefotaxime, ceftriaxone, ceftazidime or cefpodoxime), fluoroquinolones (ciprofloxacin or ofloxacin), aminoglycosides (gentamicin, amikacin or tobramycin) and carbapenems (meropenem or ertapenem):

- Of 2,686 isolates, 337 (12.5%) were 3GC resistant. Of those, 273 were ESBL producers and 64 were ESBL negative
- Of 2,688 isolates, 655 (24.4%) were resistant to ciprofloxacin
- Of 2,693 isolates, 295 (11%) were resistant to gentamicin [360 (13.4%) of 2,694 were aminoglycoside-resistant (i.e. resistant to gentamicin, tobramycin or amikacin)]
- Six (0.2%) of 2,678 isolates were resistant to carbapenems. Of those, two were confirmed carbapenemase-producers: NDM (1) and OXA-48 (1)

Resistance to 3GC has been increasing since 2004, reaching its highest level to date in 2015 (**Figure 1**). Resistance to ciprofloxacin and aminoglycosides decreased in 2015 compared with 2014. ESBLs were detected in 284 (10.6%) of 2,684 isolates tested. In 2015, ESBL production by invasive *E. coli* isolates was at its highest level since surveillance began. ESBL production has been increasing since 2004.

In 2015, Ireland had moderately high levels (10 to <25%) of resistance to 3GC (**Figure 2**), ciprofloxacin and aminoglycosides (ranking 16th, 17th and 13th, respectively, of 30 countries reporting to EARS-Net). The median proportions for resistance among EARS-Net countries were 12.5% for 3GC, 24.7% for ciprofloxacin and 12.5% for aminoglycosides.

Of 2,676 isolates tested against all five "indicator" antimicrobials, 389 (14.6%) reported from 46 hospitals/institutions were identified as multi-drug resistant (MDR) *E. coli*, defined as resistance to three or more of the indicator antimicrobials **OR** any isolate with resistance to carbapenems, a slight decrease from 15.0% in 2014. A significant increase in MDR-*E. coli* was observed from 2009 to 2014 (P<0.001). In 2015, MDR *E. coli* decreased slightly.

The frequency of invasive *E. coli* infection increased with female gender x 1.2 fold (P<0.001) and age, with the majority (n=2,040; 76%) occurring in those over 60 years (median = 72 years; 95%CI, 71-73).

Klebsiella pneumoniae

There were 401 reports of invasive *K. pneumoniae* BSI from 387 patients, an increase of 12% from 2013 (n=358). The observed decrease was due to lower population coverage in 2015 (see introduction). **Table 1** displays annual trends since 2008 in the proportion of *K. pneumoniae* isolates resistant to the five "indicator" antimicrobials (as described in section on *E. coli* above):

- Of 399 isolates, 70 (17.5%) were resistant to 3GC, of which 51 were ESBL producers and 19 were ESBL negative
- Of 399 isolates, 86 (21.6%) were resistant to ciprofloxacin
- Of 401 isolates, 68 (17.0%) were resistant to gentamicin [72 (18%) of 401 were aminoglycoside-resistant (i.e. resistant to gentamicin, tobramycin or amikacin)]
- Of 401 isolates, nine (2.2%) were carbapenem resistant. Of those, seven were carbapenemase-producers reported from four hospitals; OXA-48 (6) and KPC (1), an increase from two in 2014; OXA-48 (1) and KPC (1). The remaining two isolates were not carbapenemase-producers

Resistance to 3GC, ciprofloxacin and gentamicin/aminoglycosides all increased in 2015, compared with 2014. Resistance to ciprofloxacin and gentamicin/aminoglycosides reached the highest levels since surveillance began and 3GC-resistance the second highest level after 2013 (**Figure 3**).

Three invasive *K. pneumoniae* isolates were reported as susceptible to ampicillin, suggestive of misidentification of species or misclassification, as *K. pneumoniae* are inherently resistant to ampicillin.

ESBLs were detected in 53 (13.3%) of 398 isolates tested. In 2015, ESBL production by invasive *K. pneumoniae* isolates was at its second highest level (after 2013; 18.4%) since surveillance began.

Of 398 isolates, 79 (19.8%) reported by 24 hospitals that were tested against all five "indicator" antimicrobials were identified as MDRKP, an increase from 13.7% in 2014. In 2015, MDRKP reached its highest level since surveillance began.

In 2015, Ireland ranked 21st for both 3GC and fluoroquinolone resistance and 18th for aminoglycoside resistance among 30 countries reporting to EARS-Net. The median proportions among EARS-Net countries were 3GC (26.6%), fluoroquinolone (31.9%) and aminoglycosides (21.6%), respectively. With three cases of invasive carbapenem-resistant *K. pneumoniae* (0.8%) meeting the EARS-Net case

Pathogen	Year							
	2008	2009	2010	2011	2012	2013	2014	2015
Number laboratories by year-end	**42**	**43**	**40†**	**41†**	**41**	**41**	**39†**	***38††***
E. coli								
Number of isolates	**1926**	**2064**	**2170**	**2210**	**2450**	**2530**	**2771**	***2697***
%Ampicillin-R*	70.4	68.7	68.4	71.9	69.6	70.9	69.9	***66.7***
%3GC-R*	6.7	7.1	8.0	9.1	10.3	12.3	12.0	***12.5***
%ESBL-producers*	5.0	5.8	6.1	7.5	8.8	10.5	10.2	***10.6***
%Ciprofloxacin-R*	23.3	22.3	23.6	23.8	25.2	25.3	26.2	***24.4***
%Gentamicin-R*	10.2	7.7	9.4	8.7	9.7	9.8	11.2	***11.0***
%Gentamicin/Amikacin/Tobramycin-R*	11.0	9.3	11.9	12.4	12.8	12.9	14.5	***13.4***
%Carbapenem[1]-R*	0.0	0.0	0.0	0.0	0.1	0.1	0.1	***0.2***
%MDR*	11.6	10.3	11.8	13.2	13.6	14.6	15.0	***14.5***
Number laboratories by year-end	**43**	**43**	**40†**	**41†**	**41**	**41**	**39†**	***38††***
S. aureus								
Number of isolates	**1303**	**1309**	**1251**	**1095**	**1060**	**1094**	**1117**	***1082***
Number Meticillin-R (or MRSA)	**439**	**355**	**305**	**263**	**242**	**222**	**217**	***199***
%Meticillin-R (or MRSA)	33.7	27.1	24.4	24.0	22.8	20.3	19.4	***18.4***
Number laboratories by year-end	**42**	**43**	**40†**	**41†**	**41**	**41**	**39†**	***38††***
E. faecium								
Number of isolates	**406**	**397**	**392**	**364**	**392**	**409**	**405**	***421***
%Ampicillin-R*	95.1	92.9	95.6	95.9	92.9	93.2	95.3	***94.3***
%Vancomycin-R (VREfm)	35.7	38.3	39.3	37.4	45.4	43.1	45.9	***45.6***
%HLG-R*	28.1	39.1	39.6	36.8	39.3	41.4	44.3	***49.5***
%Linezolid-R*	3.4	5.2	2.2	1.1	1.5	1.2	2.0	***0.7***
%MDR*	16.2	26.7	25.0	21.1	20.3	19.6	22.1	***21.3***
Number laboratories by year-end	**41**	**42**	**40†**	**41†**	**41**	**41**	**39†**	***38††***
K. pneumoniae								
Number of isolates	**310**	**323**	**326**	**312**	**345**	**326**	**358**	***401***
%Ampicillin-R*	99.7	99.7	99.1	100.0	98.5	99.1	100.0	***99.3***
%3GC-R*	11.4	11.2	10.2	8.0	11.9	21.2	13.1	***17.5***
%ESBL-producers*	7.7	8.2	5.1	5.6	8.8	18.4	11.0	***13.3***
%Ciprofloxacin-R*	12.8	13.0	10.5	13.2	11.9	20.9	17.3	***21.6***
%Gentamicin-R*	10.7	11.1	6.8	7.4	9.6	16.9	12.6	***17.0***
%Gentamicin/Amikacin/Tobramycin-R*	10.7	11.1	7.1	8.3	9.9	17.8	13.2	***18.0***
%Carbapenem[1]-R*	0.0	0.0	0.0	1.9	0.3	1.2	1.1	***2.2***
%MDRKP[2]*	3.9	4.3	2.2	4.6	5.3	12.3	8.2	***9.8***
%MDR*	10.3	11.9	8.0	9.0	10.2	19.7	13.7	***19.8***
Number laboratories by year-end	**42**	**43**	**40†**	**41†**	**41**	**41**	**39†**	***38††***
S. pneumoniae								
Number of isolates	**447**	**356**	**314**	**327**	**321**	**311**	**331**	***304***
%Penicillin-NS*	23.1	20.2	18.2	19.6	19.6	20.7	17.1	***17.5***
of which: %HLR	*6.0*	*5.6*	*4.8*	*6.1*	*4.7*	*2.6*	*2.4*	***0.3***
%Int	*16.8*	*13.8*	*12.7*	*13.5*	*15.0*	*18.0*	*14.5*	***17.2***
%Erythromycin-R*	16.7	17.3	15.7	18.9	16.9	17.9	13.8	***15.2***
%Penicillin-NS/Erythromycin-R	10.4	11.9	12.6	13.8	12.5	13.0	11.0	***10.8***
Number laboratories by year-end	**42**	**43**	**40†**	**41†**	**41**	**41**	**39†**	***38††***
E. faecalis								
Number of isolates	**301**	**289**	**298**	**265**	**298**	**336**	**315**	***294***
%Ampicillin-R*	0.7	2.1	0.7	0.8	4.0	2.7	1.6	***0.7***
%Vancomycin-R (VREfa)	3.7	0.7	0.3	4.9	3.0	2.1	2.9	***1.4***
%HLG-R*	30.5	36.7	29.7	29.1	32.9	33.6	32.8	***28.0***
%Linezolid-R*	2.3	3.4	2.5	1.2	0.0	0.6	1.0	***0.4***
Number laboratories by year-end	**41**	**42**	**40†**	**41†**	**41**	**41**	**39†**	***38††***
P. aeruginosa								
Number of isolates	**199**	**248**	**222**	**184**	**219**	**207**	**182**	***201***
%Piperacillin/tazobactam-R*	9.7	8.9	10.0	2.8	17.4	15.7	16.5	***14.0***
%Imipenem/meropenem-R*	9.3	10.0	8.3	12.0	19.4	13.1	11.6	***16.4***
%Ciprofloxacin-R*	21.8	12.1	13.2	12.6	20.6	15.0	13.7	***13.5***
%Gentamicin-R*	9.0	7.7	8.7	6.5	11.9	11.6	4.9	***3.5***
%Gentamicin/Amikacin/Tobramycin-R*	9.0	8.1	8.6	6.5	11.9	11.6	5.5	***7.0***
%MDR*	11.1	6.4	6.5	4.0	13.0	9.4	6.7	***7.5***
Number laboratories by year-end						**41**	**39†**	***38††***
Acinetobacter spp.								
Number of isolates	*No data*	*No data*	*No data*	*No data*	*No data*	**91**	**93**	***87***
%Ciprofloxacin-R*						*3*	*8*	***7***
%Gentamicin-R*						*0*	*3*	***4***
%Gentamicin/Amikacin/Tobramycin-R*						*1*	*3*	***5***
%Imipenem/meropenem-R*						*4*	*4*	***6***
%MDR*						*0*	*2*	***3***

R, Resistant; **NS**, Non-Susceptible [includes isolates with intermediate (**Int**) and high-level resistance (**HLR**)]
MRSA, Meticillin-Resistant *S. aureus*; **VREfm**, Vancomycin-Resistant *E. faecium;* **VREfa**, Vancomycin-Resistant *E. faecalis*
HLG, High-Level Gentamicin; **3GC**, 3rd-Generation Cephalosporin (includes cefotaxime, ceftriaxone, ceftazidime)
ESBL, Extended-Spectrum Beta-Lactamase; **MDR**, Multi-Drug Resistant
* Not all isolates tested
† The number of laboratories processing blood cultures has changed on a number of occasions up to 2014; however, coverage of acute hospitals has remained at 100%
†† Three laboratories each suspended their participation in EARS-Net for a period of two quarters; by the year-end two laboratories had re-commenced EARS-Net and coverage of acute hospitals in 2015 was estimated to be 97%
[1] Carbapenems include imipenem, meropenem and ertapenem
[2] MDRKP, MDR *K. pneumoniae* phenotype (ESBL-producer plus non-susceptibility to Ciprofloxacin and Gentamicin) OR carbapenemase-producer (e.g. KPC, OXA-48)

definition for carbapenem resistance, which is less sensitive than that used in Ireland, Ireland ranked joint 16th of 30 countries in 2015, with the median proportion among EARS-Net countries being 0.9% (**Figure 5**).

The frequency of invasive *K. pneumoniae* infection increased with male gender x 1.7 fold (P=0.001) and age, with the majority of infections (n=293; 73%) occurring in those over 60 years (median = 69 years; 95%CI, 68-71).

Pseudomonas aeruginosa

There were 201 reports of invasive *P. aeruginosa* infection (blood = 200 and CSF = 1) from 195 patients, an increase of 10.4% from 2014 (n=182). The observed increase occurred despite lower population coverage in 2015 (see introduction). **Table 1** displays annual trends since 2008 in the proportion of *P. aeruginosa* isolates resistant to the five "indicator" antimicrobials/antimicrobial classes [piperacillin-tazobactam, ceftazidime, carbapenems (meropenem or imipenem), fluoroquinolones (ciprofloxacin or ofloxacin) and aminoglycosides (gentamicin, amikacin or tobramycin)]:

- Of 200 isolates, 28 (14.0%) were resistant to piperacillin-tazobactam
- Of 201 isolates, 17 (8.5%) were resistant to ceftazidime
- Of 201 isolates, 33 (16.4%) were resistant to imipenem or meropenem
- Of 200 isolates, 27 (13.5%) were resistant to ciprofloxacin
- Of 201 isolates, seven (3.5%) were resistant to gentamicin [14 (7.0%) of 201 were aminoglycoside-resistant (i.e. resistant to gentamicin, tobramycin or amikacin)]

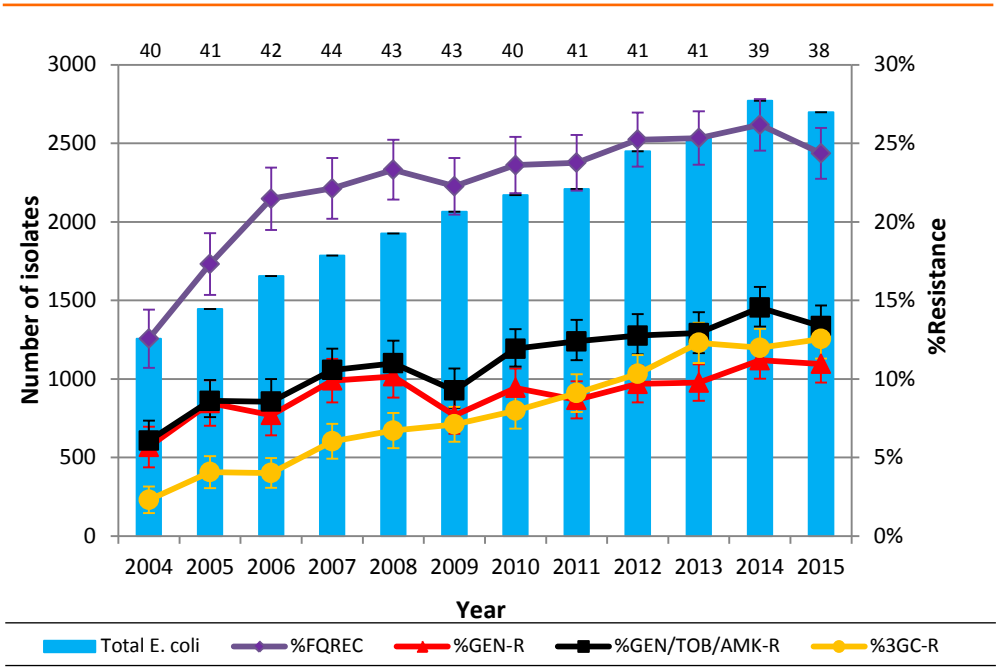


Figure 1. Trends for E. coli – total numbers of E. coli and percentage resistance to 3rd generation cephalosporins (3GCs), ciprofloxacin/ofloxacin (CIP/OFX), gentamicin (GEN) and gentamicin/amikacin/tobramycin (GEN/AMK/TOB) with 95% confidence intervals
Number of participating laboratories by year-end indicated above the bars

Table 2. Age and gender breakdown of patients by organism with major resistance profiles (data from laboratories participating in enhanced surveillance for 2015). The proportion of isolates detected <48 hours and >5 days post-admission is also shown

		Total for 2015	Percent female	Mean age in years	Detected <48 hours after admission	Detected >5 days after admission
Staphylococcus aureus	Meticillin Resistant (MRSA)	**97**	34%	69.5	47%	43%
	Meticillin Susceptible	**462**	40%	57.7	68%	22%
Streptococcus pneumoniae	Penicillin non-Susceptible	**25**	40%	61.3	96%	4%
	Penicillin Susceptible	**97**	51%	63.5	95%	5%
Enterococci	Vancomycin Resistant	**78**	35%	61.7	14%	77%
	Vancomycin Sensitive	**191**	41%	66.0	43%	48%
Escherichia coli	Fluoroquinolone Resistant	**285**	46%	73.5	74%	20%
	Fluoroquinolone Susceptible	**929**	59%	67.0	77%	17%
Klebsiella pneumoniae		**172**	39%	67.3	59%	32%
Pseudomonas aeruginosa		**96**	40%	69.5	59%	35%

In 2015, resistance to all but one of the indicator antimicrobials (imipemen/meropenem) decreased compared with 2014.

Fifteen (7.5%) of 200 isolates reported from 12 hospitals that were tested against all five "indicator" antimicrobials were identified as MDR *Pseudomonas aeruginosa*, defined as resistant to three or more of the indicator antimicrobials:

- Two resistant to all five antimicrobial classes
- Seven resistant to four of five antimicrobial classes
- Six resistant to three of five antimicrobial classes

Antimicrobial resistance in invasive *P. aeruginosa* isolates in Ireland are at moderately low levels in comparison with other European countries, with Ireland ranking between 18th and 23rd of 30 countries for all five indicator antimicrobials.

The frequency of invasive *P. aeruginosa* infection increased with male gender x 1.5 fold (P=0.002) and age, with the majority of infections (n=144; 71.6%) occurring in those over 60 years (median = 68 years; 95%CI, 66-71).

Acinetobacter spp.
There were 87 reports of invasive infection caused by *Acinetobacter spp.* (blood = 85 and CSF = 2) from 86 patients, compared with 93 reports in 2014. The observed decrease was due to lower population coverage in 2015 (see introduction). **Table 1** displays annual trends since 2013 in the proportion of *Acinetobacter spp.* isolates resistant to the three "indicator" antimicrobials/antimicrobial classes [carbapenems (meropenem or imipenem), fluoroquinolones (ciprofloxacin or ofloxacin) and gentamicin]:

- Of 84 isolates, five were resistant to imipenem or meropenem
- Of 83 isolates, six were resistant to ciprofloxacin
- Of 81 isolates, three were resistant to gentamicin [four of 81 were aminoglycoside-resistant (i.e. resistant to gentamicin, tobramycin or amikacin)]

Two of 76 isolates reported from two hospitals were identified as MDR *Acinetobacter spp.*, i.e., resistant to all three "indicator" antimicrobials.

Enterococcus faecium
There were 421 reports of *E. faecium* BSI from 406 patients, an increase of 4% from 2014 (n=405). The observed increase occurred despite lower population coverage in 2015 (see introduction). **Table 1** displays the annual trends since 2008 in the proportion of *E. faecium* isolates resistant to the three "indicator" antimicrobials (ampicillin, vancomycin and high-level gentamicin):

- Of 419 isolates, 191 (45.6%) were resistant to vancomycin, which is similar to the proportion of vancomycin-resistant *E. faecium* (VREfm) in 2014 (45.9%) **(Figure 6)**
- Of 396 isolates, 196 (49.5%) were resistant to high-level gentamicin (**Figure 6**)
- Of 395 isolates tested against the three "indicator" antimicrobials, 84 (21.3%) were resistant to all three and termed MDR *E. faecium*. These were reported from 18 hospitals, with the majority from nine tertiary hospitals (n=67; 80%). This represents a slight decrease from the proportion of MDR *E. faecium* at 22.1% in 2014

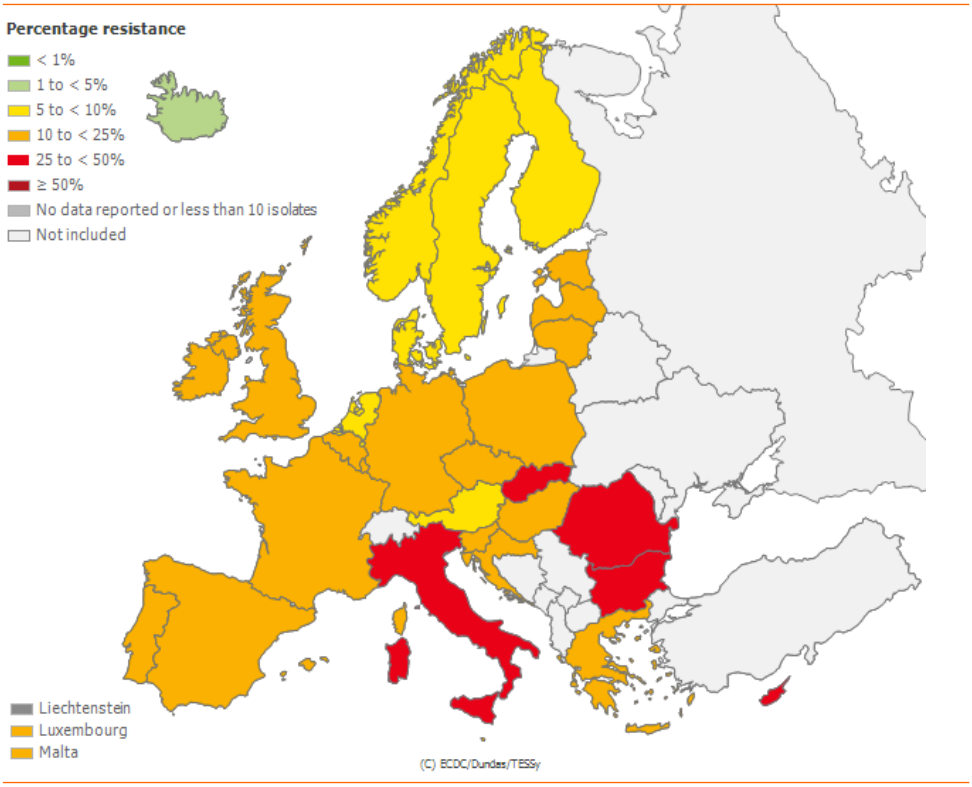


Figure 2. Distribution of 3rd-generation cephalosporin resistant E. coli in EARS-Net countries in 2015
Map downloaded from ECDC's TESSy database on 04/08/2016:
http://ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/database.aspx

The proportion of VREfm first exceeded 40% in 2012 and has stayed between 43 and 45% since then. Since 2008, Ireland has had the highest proportion of VREfm in Europe. In 2015, countries with the next highest proportions of VREfm were: Cyprus (28.6%), Croatia (25.8%) and Romania (25.0%) (**Figure 7**). The median proportion of VREfm in EARS-Net countries was 9.9%, an increase from 4.5% in 2014.

The frequency of invasive *E. faecium* infection increased with male gender x 1.5 fold (P<0.001) and age, with the majority of infections (n=300; 71.3%) occurring in those over 60 years (median = 69 years; 95%CI, 67-72).

Enterococcus faecalis

There were 294 reports of *E. faecalis* BSI from 292 patients, a decrease from 315 reports in 2014. The observed decrease was due to lower population coverage in 2015 (see introduction). **Table 1** displays annual trends since 2008 in the proportions of *E. faecalis* isolates resistant to the three "indicator" antimicrobials (as described in section on *E. faecium*):

- Of 294 isolates, four (1.4%) were resistant to vancomycin (VREfa), with Ireland ranking 8th of European countries for resistance. The proportion of VREfa in Ireland has decreased from the highest reported proportion of 4.9% in 2011. In 2015, the median proportion in Europe was 0.3%
- Of 264 isolates, 74 (28.0%) were resistant to high-level gentamicin

Two isolates were reported resistant to ampicillin, suggestive of misidentification of species or misclassification, as ampicillin resistance is rare in *E. faecalis*.

The frequency of invasive *E. faecalis* infection increased with male gender x 1.4 fold (P=0.007) and age, with the majority of infections (n=198; 67.3%) occurring in those over 60 years (median = 70 years; 95%CI, 66-73).

Staphylococcus aureus

There were 1,082 reports of *S. aureus* BSI from 1,048 patients, compared with 1,117 reports in 2014. The observed decrease was due to lower population coverage in 2015 (see introduction). Of those, 199 (18.4%) were MRSA, which represents the lowest annual proportion since surveillance began in 1999 (**Table 1** shows data from 2008). In 2010, the proportion was 24.4%, the first year that MRSA accounted for <25% of *S. aureus* BSI in Ireland, thus changing from red to orange on the EARS-Net map and 2014 was the eighth successive year in which a decrease was observed (significant downward trend, P<0.001) (**Figure 8**). Overall, there was an 8.3% reduction in MRSA BSI compared with 2014 (199 versus 217) and 1.9% reduction in MSSA BSI compared with 2014 (883 versus 900).

Despite the decrease in numbers and proportion of MRSA BSI in 2014, Ireland still had one of the higher proportions of MRSA in Europe (**Figure 9**). Ireland ranked 11th of 30 countries reporting to EARS-Net (compared to 12th of 30 countries in 2014), with the median proportion of MRSA BSI at 12.6%. All countries with MRSA proportions higher than Ireland are located in Southern and Central/Eastern Europe.

The overall rate of MRSA BSI in acute hospitals in 2015 was 0.050 cases per 1,000 BDU, a decrease from 0.055 in 2014, while the rate of MSSA BSI decreased from 0.227 to 0.223 [rates are calculated from denominator data (bed days used) obtained from the HSE's Business Information Unit (BIU) for all acute public hospitals and directly from private hospitals where available, where both numerator (*S. aureus* numbers) and denominator data have been provided].

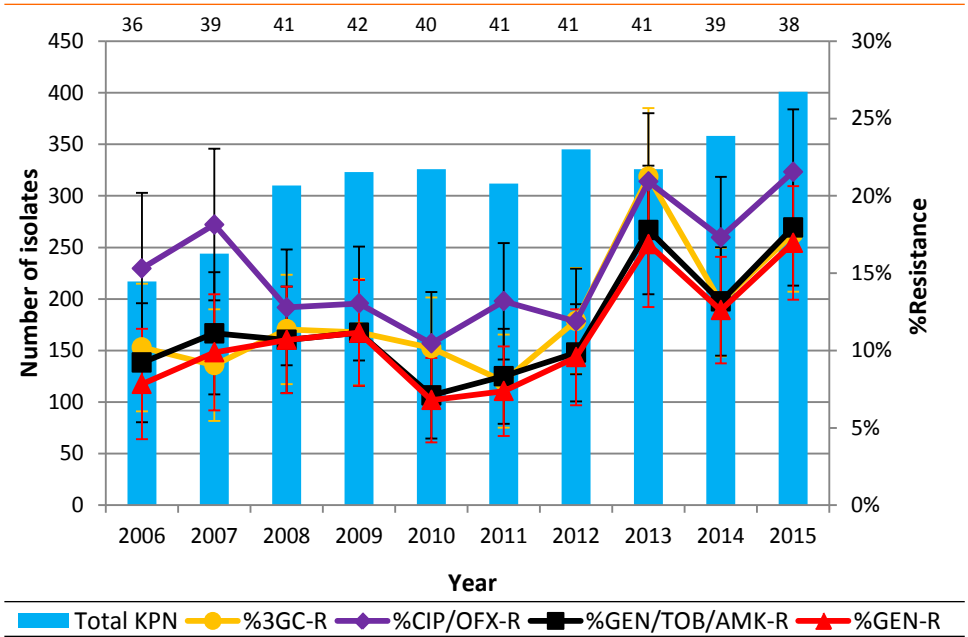


Figure 3. Trends for K. pneumoniae – total numbers of K. pneumoniae and percentage resistance to 3rd generation cephalosporins (3GCs), ciprofloxacin/ofloxacin (CIP/OFX), gentamicin (GEN) and gentamicin/amikacin/tobramycin (GEN/AMK/TOB) with 95% confidence intervals
Number of participating laboratories by year-end indicated above the bars

The frequency of invasive *S. aureus* infection increased with male gender x 1.7 fold (P<0.001) and age, with the majority of infections (n=657; 60.7%) occurring in those over 60 years. The median age for MRSA BSI = 73 years (95%CI, 70-76) was older than for MSSA BSI = 64 years (95%CI, 62-66). This was considered to be a significant difference, as the confidence intervals did not overlap.

Streptococcus pneumoniae

There were 304 reports of invasive *S. pneumoniae* infection (blood = 297 and CSF = 7) from 303 patients, compared with 331 reports in 2014. The lower population coverage attained in 2015 may have also contributed to this decrease (see introduction). **Table 1** displays annual trends since 2008 in the proportions of *S. pneumoniae* isolates non-susceptible/ resistant to penicillin and erythromycin.

Penicillin non-susceptible *S. pneumoniae* (PNSP) accounted for 17.5% (n=53) of all isolates tested against penicillin (n=302). Of the PNSP isolates, 52 were intermediately-resistant (Int; MIC=0.1-1 mg/L for laboratories following the Clinical Laboratory Standards Institute (CLSI) guidelines

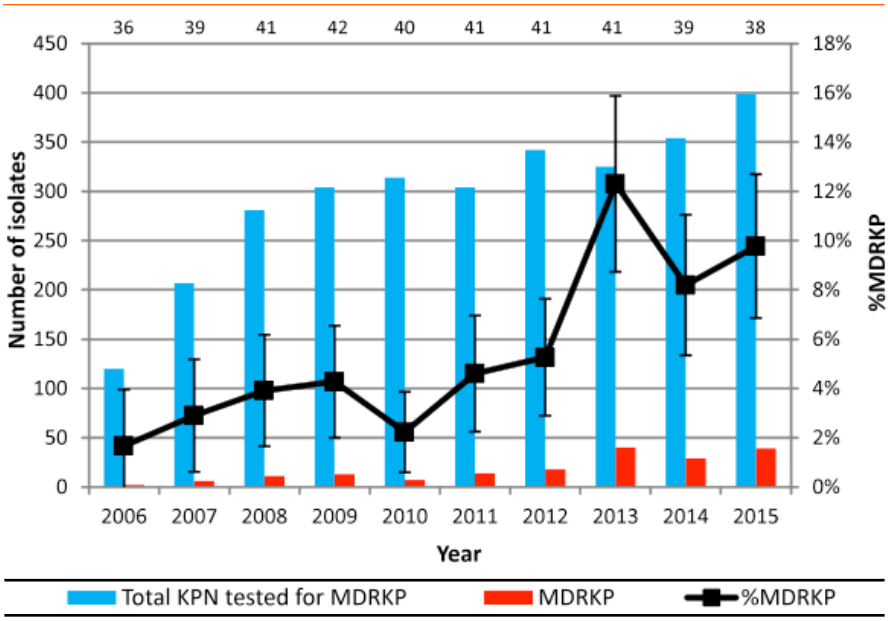


Figure 4. Trends for K. pneumoniae isolates with the MDRKP phenotype (simultaneously ESBL-producers and non-susceptible to both ciprofloxacin and gentamicin and/or a carbapenemase-producer) –– numbers and percentage with MDRKP phenotype with 95% confidence intervals
Number of participating laboratories by year-end indicated above the bars

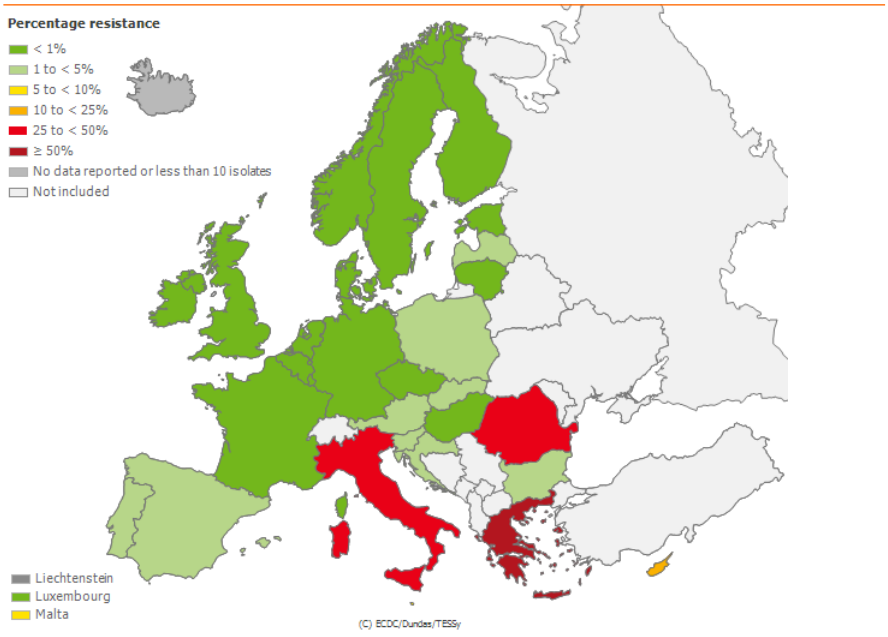


Figure 5. Distribution of carbapenem-resistant K. pneumoniae in EARS-Net countries in 2015
Map downloaded from ECDC's TESSy database on 04/08/2016:
http://ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/database.aspx

(for non-meningitis syndrome via oral administration) and MIC=0.1-2mg/L for those following European Committee on Antimicrobial Susceptibility Testing (EUCAST) non-meningitis guidelines) and one was high-level resistant (HLR; MIC >1.0mg/L for CLSI and >2mg/L for EUCAST) to penicillin. Penicillin susceptibility was not determined for two isolates. Erythromycin resistance was seen in 45 of 297 isolates (15%).

There was a slight increase in the proportion of PNSP isolates from 17.1% in 2014 to 17.5% in 2015, as displayed in **Figure 10**. The proportion that displayed penicillin HLR decreased from 2.4% to 0.3%. In 2015, Ireland remained among European countries with higher proportions of PNSP, ranking 11th of 29 countries overall; and 5th of 22 countries reporting ≥50 isolates. In 2015, the median proportion of EARS-Net countries was 11.2%. However, it is important to consider that comparison with other EARS-Net countries can be problematic due to the possibility of different interpretive criteria being applied to the data from different countries (and indeed from different laboratories within a country):

- CLSI provides three sets of breakpoints for interpreting penicillin susceptibility of *S. pneumoniae* isolates: meningitis, non-meningitis and oral
- EUCAST provides two sets of breakpoints: meningitis and infections other than meningitis

Most Irish microbiology laboratories have already switched, or are currently in the process of switching, from CLSI to EUCAST guidelines: 33 laboratories had switched by the end of 2015 (unchanged from 2014). In Ireland, EARS-Net data are reported using the EUCAST breakpoints for infections other than meningitis or the CLSI breakpoints for "oral administration" (which correspond to the original CLSI breakpoints), as these are broadly similar for epidemiological purposes and thus facilitate a more meaningful analysis of the data. This also permits a relatively consistent approach for comparing historical data.

Moderately high levels of erythromycin resistance were seen, with Ireland ranking 14th of 29 countries overall and 9th of 22 countries reporting 50 or more isolates. This is similar to the situation observed in much of Southern and Central/Eastern Europe. In 2015, the median proportion amongst EARS-Net countries was 14.4%.

Of 295 isolates tested against both penicillin and erythromycin in 2015, 32 (10.8%) were simultaneously PNSP (31 Int, one HLR) and erythromycin-resistant, which is a slight increase from 2014 (10.4%).

In 2007, a national pilot project was established as a collaborative initiative between RCSI, Beaumont Hospital, Children's University Hospital, Temple St and HPSC, to obtain serotyping data on invasive *S. pneumoniae* isolates. This project pre-dates the introduction of the 7-valent pneumococcal conjugate vaccine (PCV7) into the childhood immunisation schedule in September 2008. PCV13 replaced PCV7 from September 2010.

In 2015, serotype data were available for 276 pneumococcal isolates reported by 29 of the 30 laboratories reporting pneumococcal isolates to EARS-Net, representing 90.8% of all pneumococcal isolates reported:

- Of 158 isolates from patients aged ≥65 years, 106 (67.1%) belonged to serotypes included in the PPV23 vaccine
- Only 12 isolates were referred for typing from patients aged <2 years (the target population for the PCV13 vaccine) and three of these were serotypes included in the vaccine

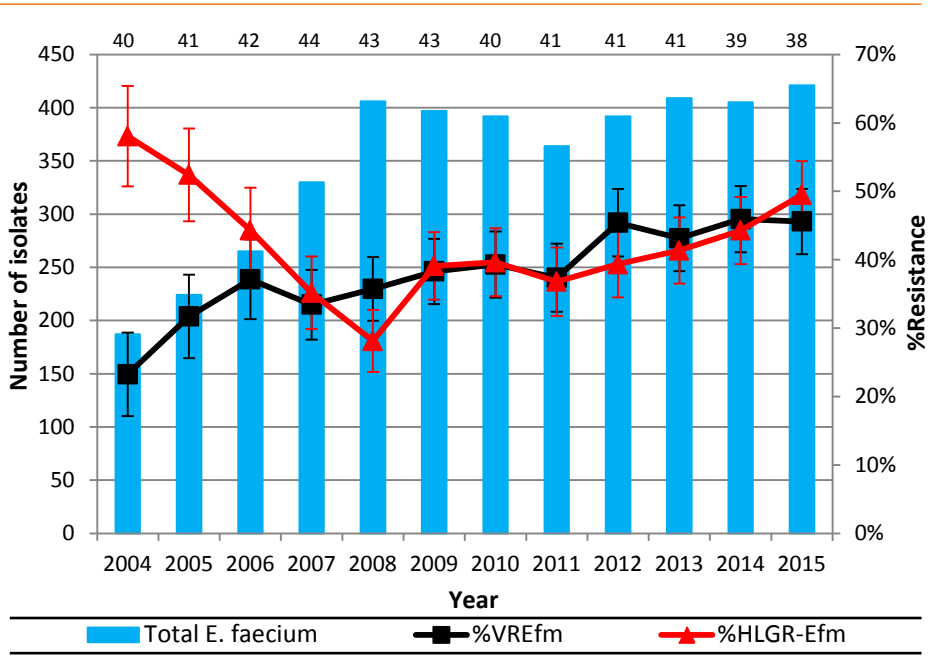


Figure 6. Trends for E. faecium – total numbers of E. faecium and percentage resistance to vancomycin (VREfm) and high-level gentamicin (HLG) with 95% confidence intervals
Number of participating laboratories by year-end indicated above the bars

- The most common serotypes identified were: 8 (n=28), 19A (n=27), 12F (n=24), 7F (n=22), 3 (n=21), 22F (n=18), 9N (n=13), 24F (n=12) and 35B (n=11) representing 68.8% of all isolates typed.

Of the 53 PNSP isolates, 47 (88.7%) were serotyped:

- Of 30 isolates from patients age ≥65 years, 13 (43.3%) belonged to serotypes included in the PPV23 vaccine
- Of three isolates from children <2 years, two belonged to serotypes included in the PCV13 vaccine
- The most common serotypes identified were: 19A (n=17), 35B (n=11) and 15B (n=6) representing 72.3% of all PNSP isolates typed.

Ongoing surveillance of the predominant serotypes is required, as strains with non-vaccine serotypes have been reported to increase in prevalence following the introduction of conjugate vaccines in other countries. Hence the need for a fully-resourced Irish pneumococcal reference laboratory. Refer to the chapter on invasive pneumococcal disease (IPD) in Ireland in 2015 for additional information on pneumococcal serotyping.

In 2015, the rate of IPD in Ireland was estimated at 6.8 cases per 100,000 population, a decrease compared with 7.2 in 2014 [note that both rates were calculated using 2011 census data; the rate for 2015 is adjusted to account for the reduced population coverage (to 97%) by EARS-Net]. The highest rates of IPD were observed in the older age groups [adults aged 65-74 (22.0 per 100,000), 75-79 (33.3 per 100,000) and ≥80 (53.7 per 100,000)], with a smaller peak in young children [aged <1 year (6.9 per 100,000) and 1 year (9.6 per 100,000)] as displayed in **Figure 11**. The IPD rates in all age groups were broadly similar to 2014.

Males were approximately 1.2-times more likely to have an invasive *S. pneumoniae* infection than females, but this was not statistically significant (P=0.17). The frequency of invasive *S. pneumoniae* infection increased with age, the majority (n=196; 64%) occurring in those over 60 years (median = 68 years; 95%CI, 65-70).

EARS-Net Enhanced Surveillance

Since 2004, EARS-Net participants are invited to also provide enhanced demographic and clinical data on a voluntary basis regarding invasive pathogens causing BSI.

In 2015, enhanced surveillance data on 2,432 individual records (cases or isolates under the EARS-Net definition) were submitted from 22 participating laboratories, representing 45% of all reports to EARS-Net. **Table 2** displays demographic and other basic data for the major resistance profiles of pathogens reported to EARS-Net enhanced surveillance.

- ***S. aureus* BSI**
  - 71% of MRSA and 51% of MSSA BSI were reported as healthcare-associated
  - 25% of MRSA BSIs were reported as device-associated:
    - 11% CVC/PICC-associated and 4% PVC-associated
  - 16% of MSSA BSIs were reported as device-associated:
    - 6% CVC/PICC-associated and 5% PVC-associated
  - A recent antimicrobial exposure history was reported for 32% of patients with MRSA and 22% with MSSA BSI

- **Enterococcal BSI**
  - 95% of vancomycin-resistant enterococcal (VRE) and 66% of vancomycin-susceptible enterococcal (VSE) BSI were reported as healthcare-associated

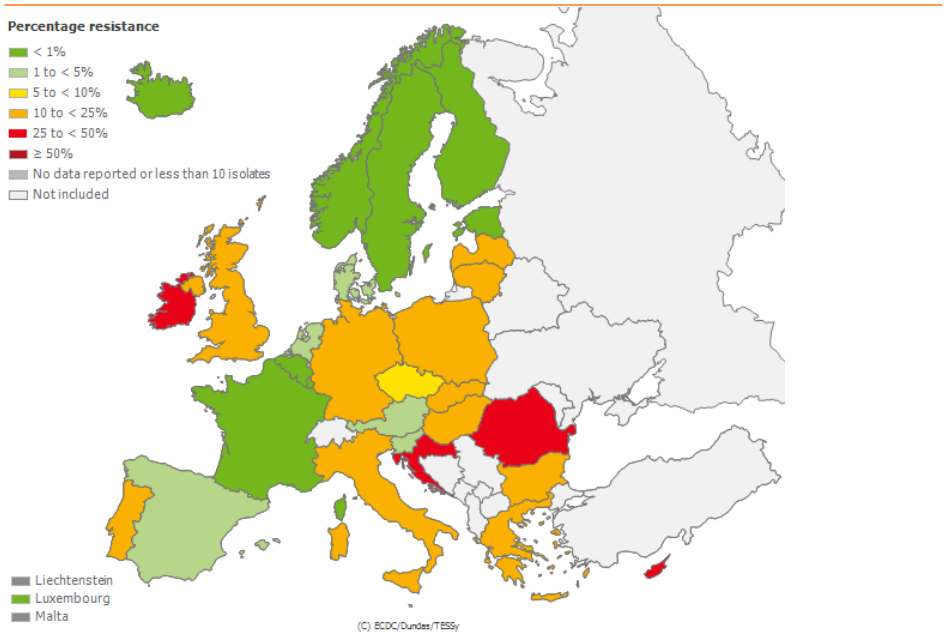


Figure 7. Distribution of vancomycin-resistant E. faecium (VREfm) in EARS-Net countries in 2015
Map downloaded from ECDC's TESSy database on 04/08/2016:
http://ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/database.aspx

- 22% of VRE BSIs were reported as device-associated:
  - 15% CVC/PICC-associated
- 10% of VSE BSI were reported as device-associated:
  - 8% CVC/PICC-associated BSI
- A recent antimicrobial exposure history was reported for 21% of patients with VRE and 14% with VSE BSI

- ***S. pneumoniae* BSI**
  - The majority of both PNSP and PSSP BSIs were community-acquired
  - Respiratory tract infection remained the most common source of pneumococcal BSI

- ***E. coli* BSI**
  - 49% of fluoroquinolone-resistant *E. coli* (FQREC) BSI were reported as healthcare-associated versus 33% for fluoroquinolone-susceptible *E. coli (FQSEC)*
  - The most common source of *E. coli* BSI was urinary tract. Of FQREC and FQSEC BSI, 49% and 41% respectively occurred in setting of an indwelling urinary catheter
  - A recent antimicrobial exposure history was reported for 8% of patients with *E. coli* BSI

Conclusion

Antimicrobial resistance in key Gram-negative pathogens or *Enterobacteriaceae* causing invasive infection in Ireland, namely *E. coli* and *K. pneumoniae* increased further in 2015. As EARS-Net is limited to invasive isolates (blood and CSF), the true burden of infection caused by MDR-*Enterobacteriaceae* is likely to be far greater. These bacteria are among the most frequent causes of common infections, such as urinary tract infection and wound infection. They also form an important component of normal bowel flora (colonisation or carriage) in humans and animals. Therefore, carriers of MDR-*Enterobacteriaceae* tend to remain colonised indefinitely and may be an onward source of transmission to others. This poses a significant risk in healthcare settings, where infection caused by these pathogens is more difficult and more costly to treat and associated with increased patient morbidity and mortality.

Following the establishment of a national multi-drug resistant *K. pneumoniae* (MDRKP) outbreak control team (OCT) in 2013, reports were produced and correspondence issued to the acute hospitals between December 2013 and November 2014. Surveillance data indicated that MDRKP was now widely disseminated throughout acute and non-acute healthcare settings in Ireland, including primary and residential care. The OCT recommended that a national taskforce be set up, with recommended actions to be taken by the taskforce to address the threat of increasing antimicrobial resistance in Ireland. HSE established a national healthcare-associated infection (HCAI) & AMR taskforce, which convened in September 2015. The continued increase in antimicrobial resistance observed in *Enterobacteriaceae* requires close attention from both HSE and the Department of Health, given healthcare in Ireland is delivered by both the public and private sector. The increasing incidence of carbapenem resistant *Enterobacteriaceae* (CRE) in Ireland dates back to 2011 and a national strategy to curb dissemination of these highly antimicrobial resistant pathogens is urgently required. Data from other jurisdictions where invasive CRE infections have become commonplace report mortality rates in excess of 50%. It is vital that the recommendations contained in the "Guidelines for the prevention and control of multi-drug resistant organisms, other than MRSA", published in 2013 are adequately resourced and implemented and that infection prevention and control and antimicrobial stewardship

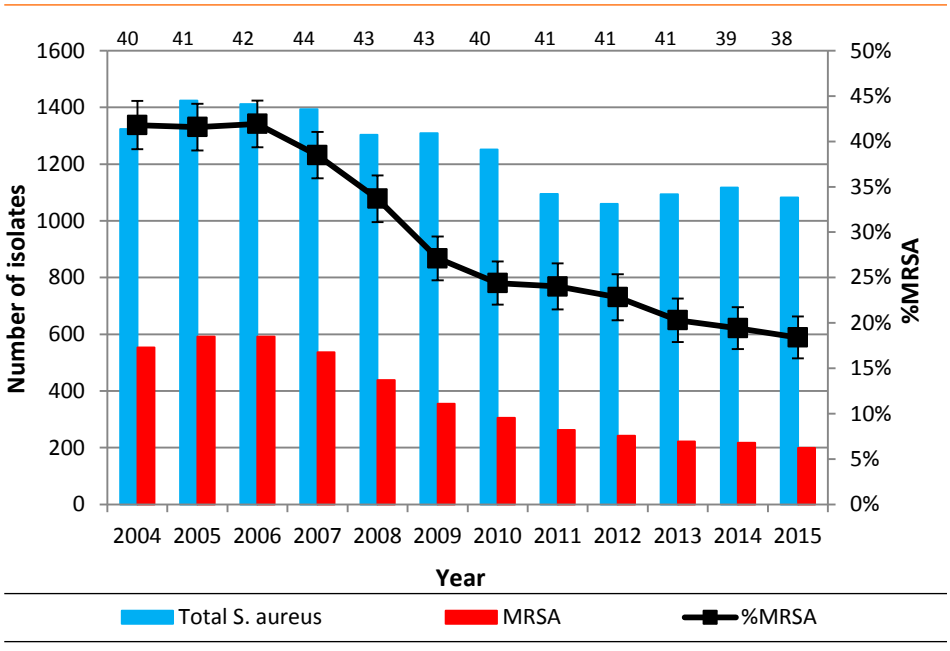


Figure 8. Trends for S. aureus – total numbers of S. aureus/MRSA and percentage MRSA with 95% confidence intervals

Number of participating laboratories by year-end indicated above the bars

resources are strengthened in acute hospitals and in the community, including primary and residential care (http://www.hpsc.ie/A-Z/MicrobiologyAntimicrobialResistance/InfectionControlandHAI/Guidelines/).

For the ninth consecutive year, Ireland remained the European country with the highest proportion of VREfm BSI (45.6%), with Croatia, Cyprus and Romania also reporting proportions over 25% and therefore appearing red on the map.

For the ninth consecutive year, the proportion of *S. aureus* BSI attributable to MRSA further declined to 18.4%, the lowest reported level since Ireland joined EARS-Net in 1999.

EARS-Net enhanced surveillance data are particularly useful in informing infection prevention and control programmes, both nationally and in those hospitals that participate in the surveillance scheme.

HPSC thanks all the microbiology laboratories for their continued participation and enthusiasm for the EARS-Net project.

The data presented in this report were taken from the EARS-Net database on **1st September 2016**.

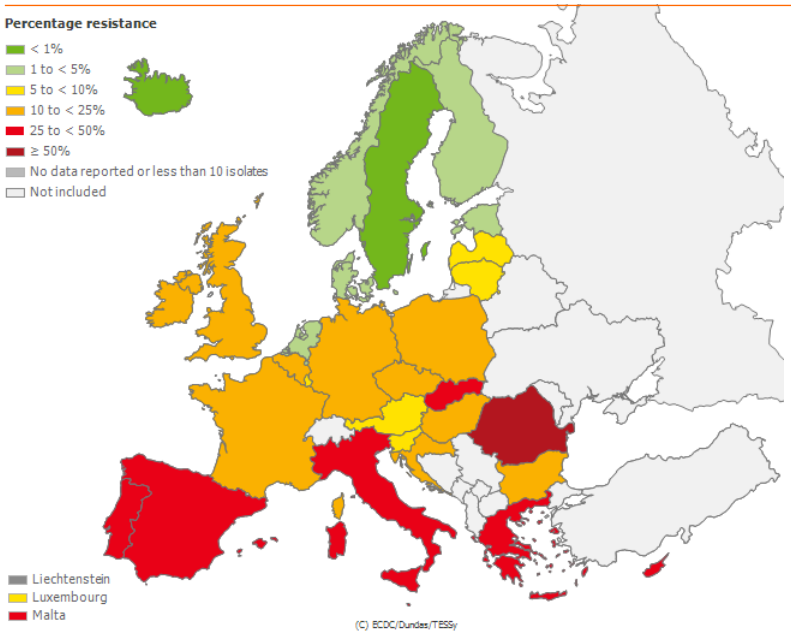


Figure 9. Distribution of MRSA in EARS-Net countries in 2015
Map obtained from ECDC on 04/08/2016:
http://ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/database.aspx

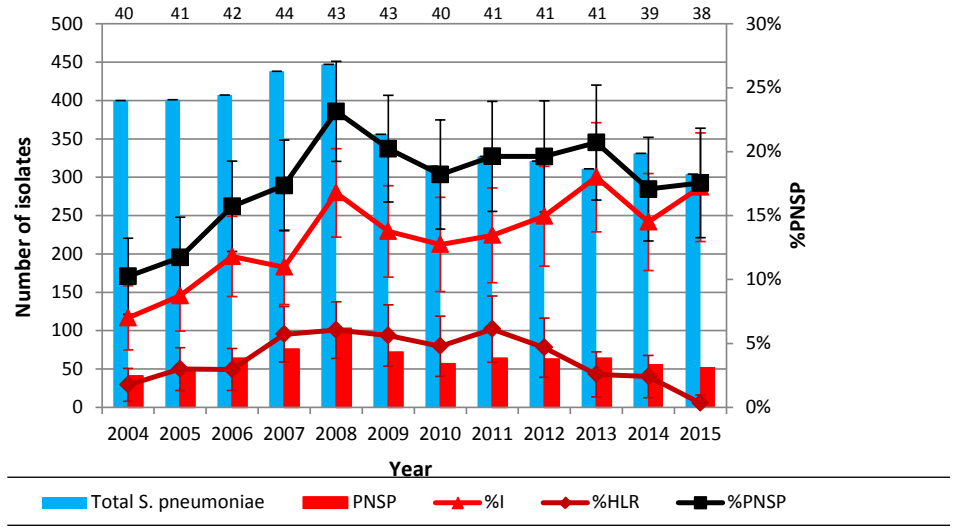


Figure 10. Trends for S. pneumoniae – total numbers of S. pneumoniae/PNSP and percentage PNSP with 95% confidence intervals
HLR, High-level resistant; I, Intermediately resistant
Number of participating laboratories by year-end indicated above the bars

Enhanced surveillance of Carbapenem Resistant *Enterobacteriaceae* (CRE)

Summary:

- In 2015, enhanced surveillance data was received on 98 cases of CRE, an increase from 2014 (n=61) and 2013 (n=26). In contrast, the national Carbapenemase Producing *Enterobacteriaceae* Reference Laboratory Service (CPEaRLS) at Galway University Hospital confirmed 140 CRE isolates as carbapenemase producers in 2015.
- Just four patients (4%) had a history of hospitalisation abroad: Bosnia and India: NDM; Romania: OXA-48 and Spain: KPC
- Clinical significance was reported for 91 patients, with the majority colonised with CRE at the time of reporting (n=66; 67%). However, CRE infection was reported for 25 patients

Introduction

Carbapenem-resistant *Enterobacteriaceae* (CRE) are multi-drug resistant (MDR) Gram-negative bacteria. The term CRE includes *Enterobacteriaceae* that produce enzymes known as carbapenemases and *Enterobacteriaceae* resistant to carbapenems (e.g., meropenem) as a result of a combination of resistance mechanisms (e.g., ESBL or AmpC β-lactamase production with bacterial cell porin loss). Carbapenemases are encoded by genes transmitted between *Enterobacteriaceae* via mobile genetic elements, known as plasmids, resulting in colonisation or infection for which antimicrobial treatment options are very limited. Carbapenemase production has spread worldwide in the past 15 years and is now a prominent resistance mechanism reported in many countries.

Detection of confirmed carbapenemase-producing CRE, hereafter known as CRE, became notifiable in Ireland in March 2011 under the category of "unusual cluster or changing pattern of illness". Upon amendment to the Infectious Diseases Regulations in September 2011, invasive CRE infection (blood, CSF or normally sterile site) became notifiable in its own category. The CRE enhanced surveillance scheme was established in June 2011 and reporting of CRE isolates from any site, whether colonisation or infection is encouraged.

Enhanced surveillance data

CRE cases reported to enhanced surveillance

In 2015, enhanced surveillance data was received from 13 microbiology laboratories on 98 patients with confirmed CRE. Of those, 59 were male (60%) with a median age of 71 years (range: 1 month – 93 years). No CRE outbreaks were reported in 2015. **Figure 1** displays annual trends in CRE cases and types reported to enhanced surveillance since 2011.

Patient location

At the time of CRE detection, 93 patients (95%) were hospitalised, four (3%) were in long-term care facilities and one was in the community. Of 93 inpatients, 47 (51%) had been admitted from home, 15 (16%) were transfers from another acute hospital, five had been admitted from long-term care/nursing homes (5%). Admission source was not provided for 26 patients (28%). Of 15 patients who had been transferred from another acute hospital, two were repatriated from hospitals abroad (in Bosnia and Spain). The median interval from hospitalisation to first positive CRE isolate for 86 of 93 inpatients was six days (range: 0 – 91).

Presence of other multi-drug resistant organisms (MDROs)

Known colonisation or infection with MDROs other than CRE was reported for 34 patients (35%), 33 of whom were inpatients: MRSA (n=19), VRE (n=17), ESBL-producing

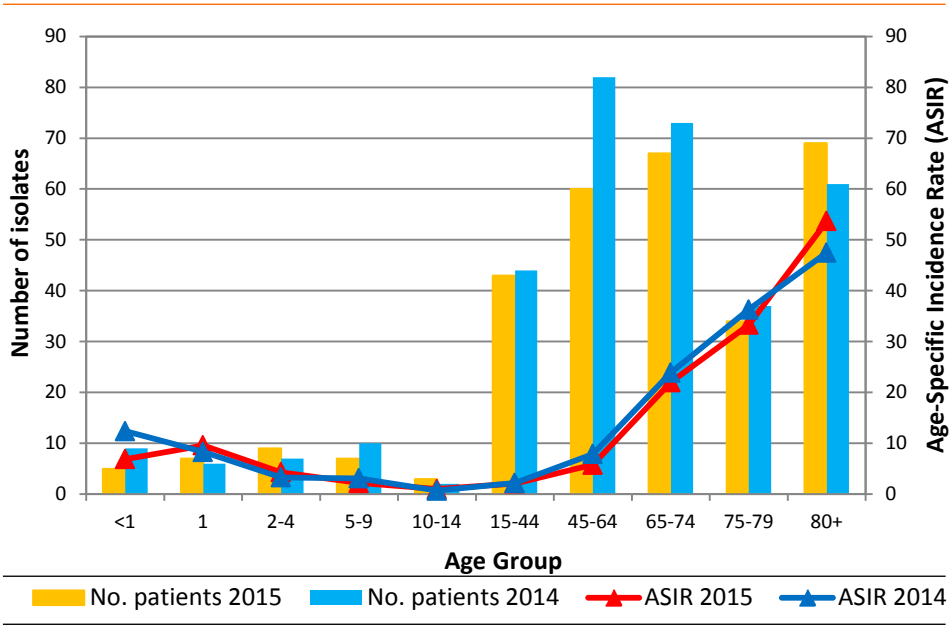


Figure 11. Numbers and age-specific incidence rates of patients with invasive S. pneumoniae infection in 2015 compared with 2014
ASIR, age-specific incidence rate

Enterobacteriaceae (n=12) and MDR *E. coli* (n=2). Twelve patients were colonised with ≥2 other MDROs.

Travel history
The travel history in the 12 months prior to CRE detection was unknown for the majority of patients (n=55; 56%). For 30 patients, there was no history of foreign travel (31%) and 13 (13%) reported foreign travel: Africa (country unspecified), Bosnia, Egypt, India, Lebanon, Pakistan, Romania, Spain and UK].

Risk factors
Risk factor data was provided on 86 patients, of whom 52 (60%) had more than one risk factor for CRE: hospitalisation in past 12 months (71; 83%); surgery in past six months (23; 27%); admission to intensive care in past 12 months (18; 21%). Reported co-morbidities included: immunocompromise (n=14); urological abnormality (n=14); diabetes mellitus (n=11); renal disease (n=11); chronic lung (n=7) and liver disease (n=1). Seven patients had no identifiable risk factors (8%) and risk factor data was unknown or not provided for the remaining 12 patients.

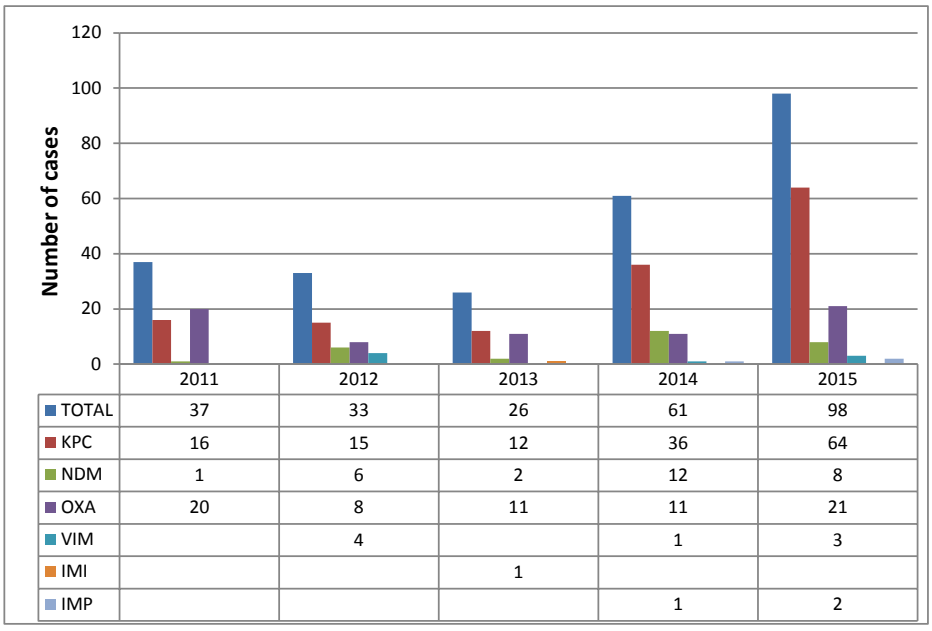
Prior antimicrobial exposure
Antimicrobial exposure history prior to isolation of CRE was provided for 59 patients (60%), 57 of whom were hospitalised and 13 of whom received more than one antimicrobial class:

- β-lactam/β-lactamase inhibitor combination agents - 46 (78%)
- Carbapenems - 10 (17%)
- Fluoroquinolones - 8 (14%)
- Aminoglycosides - 6 (10%)
- Cephalosporins - 6 (10%)
- Co-trimoxazole - 1 (2%)

Clinical significance and source of infection
The clinical significance of the CRE isolate was reported for 91 patients, representing colonisation in the majority (n=66; 73%). Infection was reported for 25 patients (27%), with urinary tract infection accounting for the majority (n=7), followed by respiratory tract (n=4) and intra-abdominal infection (n=4). It is important to note that patients who were colonised with CRE may have subsequently developed CRE infection after the case was reported to enhanced surveillance.

Specimen type
The majority of CRE isolates came from active surveillance or screening specimens; rectal or stoma swabs and faeces (n=76; 78%). Of CRE isolates from clinical specimens; eight came from blood (8%), eight from urine (8%), two from sputum and one each from a central vascular catheter tip, lung and wound swabs.

Outcome
Of 93 inpatients with CRE, outcome was reported for 68 (73%). Of those, 49 (59%) were discharged, 11 remained inpatients and eight subsequently died (12%). The contribution of CRE to patient death is not collected by enhanced surveillance. Five deaths occurred in patients with CRE infection. CRE was isolated in a post mortem microbiology specimen taken from one patient. Date of first CRE specimen and date of death was provided for five patients, with a median interval to death of 36 days (range = 6 - 68). Outcome was also reported for four of the five non-hospitalised patients, all of whom survived.



	2011	2012	2013	2014	2015
TOTAL	37	33	26	61	98
KPC	16	15	12	36	64
NDM	1	6	2	12	8
OXA	20	8	11	11	21
VIM		4		1	3
IMI			1		
IMP				1	2

Figure 1. Annual trends in CRE cases and types reported to HPSC since enhanced surveillance of CRE commenced in 2011

Please note that the reduction in reported cases between 2012 and 2013 reflects under-reporting rather than a true decline in CRE. Almost twice as many isolates were confirmed by the CPEaRLS, Galway University Hospital in 2013 (n=48) and approximately one-third as many isolates in 2014 (n=82) and 2015 (n=139) than were reported to the voluntary CRE enhanced surveillance scheme

Carbapenemase types

The rank order of carbapenemase types reported to enhanced surveillance in 2015 correlates with CPE confirmed by the reference laboratory, although 30% of CPE confirmed by the reference laboratory did not have enhanced surveillance data submitted: KPC (n=64; 65%), OXA-48 (n=21; 21%), NDM (n=8; 8%), VIM (n=3) and IMP (n=2).

Antimicrobial susceptibility

Antimicrobial susceptibility data was provided on 94 of 98 isolates (96%):

- Carbapenems
  - Meropenem: reported on 94 isolates, with 72 resistant (77%); minimum inhibitory concentrations ranged from 0.25 to >32 mg/L
  - Ertapenem: reported on 91 isolates, with 89 resistant (98%); minimum inhibitory concentrations ranged from 0.25 to >32 mg/L
- Aminoglycosides: reported on 92 isolates, with 41 (45%) resistant to one or more of the aminoglycosides listed below
  - Gentamicin: reported on 91 isolates, with 33 resistant (36%)
  - Tobramycin: reported on 61 isolates, with 25 resistant (41%)
  - Amikacin: reported on 88 isolates, with 11 resistant (13%)
- Fluoroquinolones: reported on 88 isolates, with 35 resistant (40%)
- Tigecycline: reported on 82 isolates, with 15 resistant (18%)
- Colistin: reported on 83 isolates, with two resistant (2%)

Conclusion

In 2015, 98 cases of CRE colonisation/ infection were reported to the enhanced CRE surveillance system representing an increase of 61% from 61 cases in 2014. However, data from the CPEaRLS indicate that there were more confirmed CRE than were reported to enhanced surveillance.

Acknowledgements:

Sincere thanks to colleagues working in microbiology laboratories and infection prevention and control teams across Ireland for submitting enhanced surveillance data on patients with CRE.

Sincere thanks also to colleagues in the CPEaRLS, Galway University Hospital for data on confirmed carbapenemase-producing *Enterobacteriaceae* in 2015 (Source: CPEaRLS annual report 2015).

2015

ANNUAL EPIDEMIOLOGICAL REPORT

10

COMPUTERISED INFECTIOUS DISEASE REPORTING SYSTEM (CIDR)

10. Computerised Infectious Disease Reporting (CIDR)

Summary

- The highest ever annual number of notifications was recorded on CIDR in 2015 (n=31,936)
- CIDR was available for 99% of core working hours during 2015
- Hepatitis E infection became notifiable in December 2015 and was added to the diseases notified via CIDR, bringing the total to 76 diseases
- CIDR Disaster Recovery / Business Continuity infrastructure was commissioned, deployed and tested
- IS27001 Information Security accreditation was upgraded to ISO 27001:2013 standard and retained
- The average number of active CIDR users in 2015 was 258
- 41 new users were trained during 2015
- CIDR Server Operating System upgrades were completed

CIDR OPERATIONS

INFORMATION SECURITY ACCREDITATION

The HPSC Information Security Management System (ISMS) which includes CIDR was updated in 2015 to ISO 27001:2013 standard. The system was audited in June followed by a full two day on-site maintenance audit in September 2015. HPSC and CIDR successfully made the transition to the new standard.

The HPSC Information Governance Framework, which includes CIDR, provides re-assurance to users and partners of the CIDR system, the Data Protection Commissioner and the data subjects relating to sensitive data stored and managed by the system. Maintenance of this accreditation standard is vital to information security.

CIDR USER TRAINING

Forty-one new CIDR users were trained during 2015. There were 30 public health users, (almost a 50% increase on 2014) and 11 laboratory users trained.

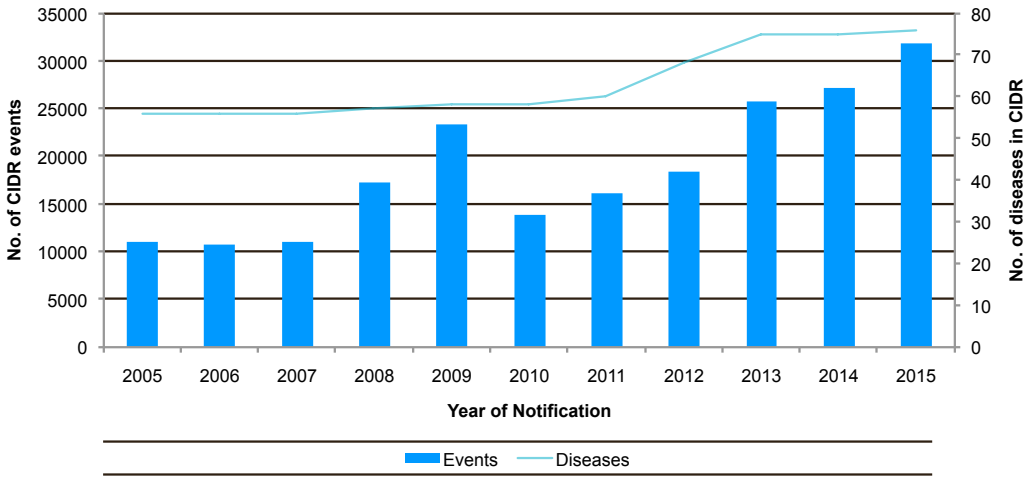


Figure 1. The volume of statutory infectious disease notifications and corresponding number of diseases in CIDR per year, since 2005 when national implementation commenced (as of 28th September, 2016)

CIDR APPLICATION SOFTWARE UPDATES

There were no functional releases of the CIDR Web Application software during 2015. With the emphasis on upgrading the hardware operating systems and on deployment of an upgraded Disaster Recovery infrastructure, risk of system unavailability and unscheduled down-time was minimised by strict change management processes that included no changes to the application.

CIDR availability was 99% of core working hours during 2015. 70% of down-time was scheduled; with users aware in advance of service interruption. Un-scheduled down-time amounted to less than one working day over the year.

GOVERNANCE AND COMMUNICATIONS

The National CIDR Steering Group continued to provide guidance and oversight of CIDR through 2015 and met by teleconference on three occasions during the year. The National CIDR User Group convened on four occasions throughout the year, also by teleconference, to discuss the ongoing use of CIDR and associated developments.

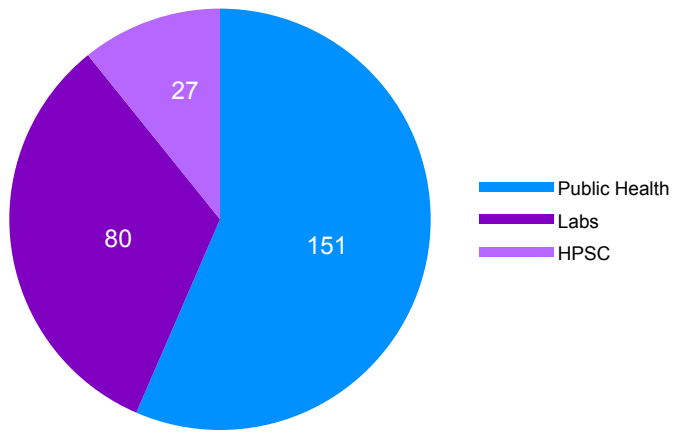


Figure 2. The number of users of the CIDR system in Departments of Public Health, in diagnostic and reference laboratories and in HPSC in 2015 (total=258)

2015

ANNUAL EPIDEMIOLOGICAL REPORT

APPENDIX 1
NOTIFIABLE INFECTIOUS DISEASES IN IRELAND

Notes:

Figures for the year 2015 presented in this appendix were extracted from the Computerised Infectious Disease Reporting (CIDR) system on the 12th September, 2016. Please note that some figures may differ from figures published previously or other chapters in this report, due to ongoing updating of notification data on CIDR.

Figures for the EARS-Net pathogens (*Escherichia coli*, Enterococci, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*) and certain sexually transmitted infections (specifically, ano-genital warts and non-specific urethritis) are not provided here, as these diseases were not notified via the CIDR system during the above period.

Table A1.1. List of notifiable infectious diseases and their respective causative pathogens (relevant to 2015) under Infectious Diseases (Amendment) Regulations 2015 (S.I. No. 566 of 2015) (December 2015)

Infectious Disease	Causative Pathogen(s)
Acute anterior poliomyelitis	Polio virus
Ano-genital warts	Human papilloma virus
Anthrax	*Bacillus anthracis*
Bacillus cereus food-borne infection/intoxication	*Bacillus cereus*
Bacterial meningitis (not otherwise specified)	
Botulism	*Clostridium botulinum*
Brucellosis	*Brucella* spp.
Campylobacter infection	*Campylobacter* spp.
Carbapenem-resistant *Enterobacteriaceae* infection (invasive)	Carbapenem-resistant *Enterobacteriaceae* (blood, CSF or other normally sterile site)
Chancroid	*Haemophilus ducreyi*
Chickenpox – hospitalised cases	Varicella-zoster virus
Chikungunya disease	Chikungunya virus
Chlamydia trachomatis infection (genital)	*Chlamydia trachomatis*
Cholera	*Vibrio cholerae*
Clostridium difficile infection	*Clostridium difficile*
Clostridium perfringens (type A) food-borne disease	*Clostridium perfringens*
Creutzfeldt Jakob disease	
variant Creutzfeldt Jakob disease	
Cryptosporidiosis	*Cryptosporidium parvum, hominis*
Cytomegalovirus infection (congenital)	Cytomegalovirus
Dengue fever	Dengue virus
Diphtheria	*Corynebacterium diphtheriae* or *ulcerans* (toxin producing)
Echinococcosis	*Echinococcus* spp.
Enterococcal bacteraemia	*Enterococcus* spp. (blood)
Escherichia coli infection (invasive)	*Escherichia coli* (blood, CSF)
Giardiasis	*Giardia lamblia*
Gonorrhoea	*Neisseria gonorrhoeae*
Granuloma inguinale	*Klebsiella granulomatis*
Haemophilus influenzae disease (invasive)	*Haemophilus influenzae* (blood, CSF or other normally sterile site)
Hepatitis A (acute) infection	Hepatitis A virus
Hepatitis B (acute and chronic) infection	Hepatitis B virus
Hepatitis C infection	Hepatitis C virus
Hepatitis E infection	Hepatitis E virus
Herpes simplex (genital)	Herpes simplex virus
Human immunodeficiency virus infection	Human immunodeficiency virus
Influenza	Influenza A and B virus
Klebsiella pneumoniae infection (invasive)	*Klebsiella pneumoniae* (blood or CSF)
Legionellosis	*Legionella* spp.
Leprosy	*Mycobacterium leprae*
Leptospirosis	*Leptospira* spp.
Listeriosis	*Listeria monocytogenes*
Lyme disease (neuroborreliosis)	*Borrelia burgdorferi*
Lymphogranuloma venereum	*Chlamydia trachomatis*
Malaria	*Plasmodium falciparum, vivax, knowlesi, ovale, malariae*
Measles	Measles virus
Meningococcal disease	*Neisseria meningitidis*
Mumps	Mumps virus
Non-specific urethritis	
Noroviral infection	Norovirus
Paratyphoid	*Salmonella* Paratyphi
Pertussis	*Bordetella pertussis*
Plague	*Yersinia pestis*
Pseudomonas aeruginosa infection (invasive)	*Pseudomonas aeruginosa* (blood or CSF)
Q Fever	*Coxiella burnetii*
Rabies	Rabies virus
Respiratory syncytial virus infection	Respiratory syncytial virus
Rotavirus infection	Rotavirus
Rubella	Rubella virus
Salmonellosis	*Salmonella* spp. other than S. Typhi and S. Paratyphi
Severe Acute Respiratory Syndrome (SARS)	SARS-associated coronavirus

Table A1.1. (Continued) List of notifiable infectious diseases and their respective causative pathogens (relevant to 2015) under Infectious Diseases (Amendment) Regulations 2015 (S.I. No. 566 of 2015) (December 2015)

Infectious Disease	Causative Pathogen(s)
Shigellosis	*Shigella* spp.
Smallpox	Variola virus
Staphylococcal food poisoning	Enterotoxigenic *Staphylococcus aureus*
Staphylococcus aureus bacteraemia	*Staphylococcus aureus* (blood)
Streptococcus group A infection (invasive)	*Streptococcus pyogenes* (blood, CSF or other normally sterile site)
Streptococcus group B infection (invasive)	*Streptococcus agalactiae* (blood, CSF or other normally sterile site)
Streptococcus pneumoniae infection (invasive)	*Streptococcus pneumoniae* (blood, CSF or other normally sterile site)
Syphilis	*Treponema pallidum*
Tetanus	*Clostridium tetani*
Toxoplasmosis	*Toxoplasma gondii*
Trichinosis	*Trichinella* spp.
Trichomoniasis	*Trichomonas vaginalis*
Tuberculosis	*Mycobacterium tuberculosis* complex
Tularemia	*Francisella tularensis*
Typhoid	*Salmonella* Typhi
Typhus	*Rickettsia prowazekii*
Verotoxigenic *Escherichia coli* infection	Verotoxin producing *Escherichia coli*
Viral encephalitis	
Viral haemorrhagic fevers	
Viral meningitis	
West Nile fever	West Nile virus
Yellow fever	Yellow fever virus
Yersiniosis	*Yersinia enterocolitica, Yersinia pseudotuberculosis*

Table A1.2 Number of notifiable infectious diseases, 2013-2015 and crude incidence rates of diseases, 2015

Infectious Disease	2013	2014	2015	CIR 2015
Acute anterior poliomyelitis	0	0	0	0.00
Anthrax	0	0	0	0.00
Bacillus cereus food-borne infection or intoxication	0	0	1	0.02
Bacterial meningitis (not otherwise specified)	21	23	32	0.70
Botulism	1	1	0	0.00
Brucellosis	1	3	0	0.00
Campylobacter infection	2275	2612	2452	53.44
Carbapenem-resistant Enterobacteriaceae infection (invasive)	0	5	8	0.17
Chancroid	0	0	0	0.00
Chickenpox - hospitalised cases	53	61	69	1.50
Chikungunya disease	0	1	1	0.02
Chlamydia trachomatis infection^	6248	6693	6797	148.14
Cholera	0	0	0	0.00
Clostridium difficile infection*	1813	1802	1943	42.35
Clostridium perfringens (type A) food-borne disease	1	0	1	0.02
Creutzfeldt Jakob disease	5	2	5	0.11
Creutzfeldt Jakob disease (variant)	0	0	0	0.00
Cryptosporidiosis	514	394	439	9.57
Cytomegalovirus infection (congenital)	7	12	15	0.33
Dengue fever	15	21	8	0.17
Diphtheria	0	0	1	0.02
Echinococcosis	1	0	0	0.00
Giardiasis	44	71	145	3.16
Gonorrhoea	1283	1314	1302	28.38
Granuloma inguinale	0	0	0	0.00
Haemophilus influenzae disease (invasive)	41	61	52	1.13
Hepatitis A (acute)	50	21	36	0.78
Hepatitis B (acute and chronic)	423	442	549	11.97
Hepatitis C	755	698	675	14.71
Hepatitis E#	NA	NA	3	-
Herpes simplex (genital)	1127	1234	1274	27.77
Human immunodeficiency virus infection§	341	377	485	10.57
Influenza (seasonal & pandemic)	1602	1757	2681	58.43
Legionellosis††	14	8	12	0.26
Leprosy	2	0	0	0.00
Leptospirosis	14	23	16	0.35
Listeriosis	8	15	19	0.41
Lyme disease	13	18	12	0.26
Lymphogranuloma venereum	5	35	20	0.44
Malaria	71	80	81	1.77
Measles‡	51	33	2	0.04
Meningococcal disease	81	82	75	1.63
Mumps	223	742	2014	43.89
Noroviral infection^	1486	807	1262	27.51
Paratyphoid	2	5	1	0.02
Pertussis	173	73	117	2.55
Plague	0	0	0	0.00
Q fever	0	0	4	0.09
Rabies	0	0	0	0.00
Respiratory syncytial virus infection^	1282	2479	2202	47.99
Rotavirus infection^	2511	2061	4158	90.62
Rubella	0	3	2	0.04
Salmonellosis	324	260	269	5.86
Severe Acute Respiratory Syndrome (SARS)	0	0	0	0.00
Shigellosis	49	57	90	1.96
Smallpox	0	0	0	0.00
Staphylococcal food poisoning	0	0	0	0.00
Streptococcus group A infection (invasive)	168	164	107	2.33
Streptococcus group B infection (invasive)‖	66	68	69	1.50
Streptococcus pneumoniae infection (invasive)**	637	680	549	11.97
Syphilis*^	550	276	438	9.55

Table A1.2 (Continued) Number of notifiable infectious diseases, 2012-2014 and crude incidence rates of diseases, 2014

Infectious Disease	2013	2014	2015	CIR 2015
Tetanus	1	1	1	0.02
Toxoplasmosis	32	20	26	0.57
Trichinosis	0	0	0	0.00
Trichomoniasis	74	92	58	1.26
Tuberculosis	370	313	303	6.60
Tularemia	0	0	0	0.00
Typhoid	10	7	9	0.20
Typhus	0	0	0	0.00
Verotoxigenic *Escherichia coli* infection	701	707	730	15.91
Viral encephalitis	6	67	47	1.02
Viral haemorrhagic fevers	0	0	0	0.00
Viral meningitis	281	435	261	5.69
West Nile fever	1	0	0	0.00
Yellow fever	0	0	0	0.00
Yersiniosis	4	5	13	0.28
Total	25831	27221	31941	

Notes
1. NA: Indicates that data not available in CIDR for the diseases and years indicated above
2. CIR, Crude incidence rate per 100,000 total population
*Since 01/01/2012, both new and recurrent cases of *Clostridium difficile* infection are notifiable
#Hepatitis E became notifiable on the 15/12/2015.
§Since 01/01/2015, all new diagnoses of HIV in HSE East were notified on the basis of confirmatory testing of one sample by the National Virus Reference Laboratory. Previously, notifications were made following testing of a second sample. This change will result in higher numbers of notifications of HIV in 2015 compared to previous years and makes comparison of data with previous years more difficult.
‡Table A1.2 excludes two measles notifications in 2013 that are on CIDR, but were laboratory negative for measles and were not epidemiologically linked to a confirmed measles case.
**Streptococcus pneumoniae* infection (invasive) figures relate to confirmed cases only since 01/07/2015.
*^The Irish case definition for syphilis changed on 01/01/2014 and from this date, syphilis notifications include early (infectious) syphilis only. Direct comparison of 2014 syphilis notification data with notification data for previous years (which includes non-infectious cases) is not valid.
^Since 17/03/2013, figures for *Chlamydia trachomatis*, noroviral infection, respiratory syncytial virus infection and rotavirus infection may refer to notifications from HSE E rather than events. Such notifications from HSE E may also refer to area of laboratory testing rather than patient's area of residence
††Legionellosis figures include both Legionnaires' disease and Pontiac fever cases
||Streptococcus group B (*Streptococcus agalactiae*) infection (invasive) in infants <90 days old or stillborn infants
For more information on notifiable infectious diseases please see HPSC's Case Definitions document available at http://www.hpsc.ie

Table A1.3 Number of notifiable infectious diseases by HSE area, 2015

Infectious Disease	HSE E	HSE M	HSE MW	HSE NE	HSE NW	HSE SE	HSE S	HSE W	Total
Bacillus cereus food-borne infection/intoxication	*	*	*	*	*	*	*	*	1
Bacterial meningitis (not otherwise specified)	14	2	0	3	1	2	5	5	32
Campylobacter infection	757	205	216	160	77	361	386	290	2452
Carbapenem-resistant Enterobacteriaceae infection (invasive)	3	0	1	0	0	4	0	0	8
Chickenpox - hospitalised cases	32	7	2	7	3	8	6	4	69
Chikungunya disease	*	*	*	*	*	*	*	*	1
Chlamydia trachomatis infection^	3466	192	454	326	249	712	837	561	6797
Clostridium difficile infection‡	803	70	127	126	77	243	251	246	1943
Clostridium perfringens (type A) food-borne disease	*	*	*	*	*	*	*	*	1
Creutzfeldt Jakob disease	2	0	0	0	1	0	1	1	5
Cryptosporidiosis	49	49	44	31	27	89	69	81	439
Cytomegalovirus infection (congenital)	8	0	2	0	1	2	2	0	15
Dengue fever	6	0	1	1	0	0	0	0	8
Diphtheria	*	*	*	*	*	*	*	*	1
Giardiasis	47	8	7	8	1	15	36	23	145
Gonorrhoea	925	17	55	35	39	62	82	87	1302
Haemophilus influenzae disease (invasive)	26	1	4	4	2	6	5	4	52
Hepatitis A (acute)	20	6	0	0	2	1	5	2	36
Hepatitis B (acute and chronic)	346	15	15	68	12	23	39	31	549
Hepatitis C	462	40	27	37	6	28	42	33	675
Hepatitis E#	*	*	*	*	*	*	*	*	3
Herpes simplex (genital)	742	25	66	56	35	128	120	102	1274
Human immunodeficiency virus infection	359	13	20	22	7	14	34	16	485
Influenza	1072	146	244	193	120	326	311	269	2681
Legionellosis§	8	0	1	0	1	0	2	0	12
Leptospirosis	6	1	3	2	0	2	0	2	16
Listeriosis	7	0	1	6	0	1	2	2	19
Lyme disease	2	1	3	0	0	0	3	3	12
Lymphogranuloma venereum	16	1	1	1	0	1	0	0	20
Malaria	51	1	4	7	0	4	10	4	81
Measles	*	*	*	*	*	*	*	*	2
Meningococcal disease	18	6	9	8	6	9	12	7	75
Mumps	379	57	165	85	267	230	438	393	2014
Noroviral infection^	735	31	56	161	31	51	78	119	1262
Paratyphoid	*	*	*	*	*	*	*	*	1
Pertussis	48	7	1	14	4	14	14	15	117
Q fever	*	*	*	*	*	*	*	*	4
Respiratory syncytial virus infection^	1046	104	136	104	161	218	282	151	2202
Rotavirus infection^	1264	339	247	352	197	561	688	510	4158
Rubella	*	*	*	*	*	*	*	*	2
Salmonellosis	100	16	23	21	10	30	38	31	269
Shigellosis	57	4	5	7	1	3	4	9	90
Streptococcus group A infection (invasive)	40	7	6	10	7	9	11	17	107
Streptococcus group B infection (invasive)||	33	5	3	5	5	6	7	5	69
Streptococcus pneumoniae infection (invasive)	191	24	75	35	24	100	74	26	549
Syphilis	319	7	20	13	2	13	35	29	438
Tetanus	*	*	*	*	*	*	*	*	1
Toxoplasmosis	6	0	0	0	0	2	9	9	26
Trichomoniasis	28	0	4	8	9	7	1	1	58
Tuberculosis	132	14	15	16	17	15	69	25	303
Typhoid	5	0	0	1	1	1	1	0	9
Verotoxigenic *Escherichia coli* infection	84	85	109	67	25	112	112	136	730
Viral encephalitis	21	2	3	3	0	9	5	4	47
Viral meningitis	118	16	19	26	12	20	22	28	261
Yersiniosis	5	0	0	0	0	0	1	7	13

Notes:
1. This table does not include details of diseases for which a zero number of cases were notified; see Table A1.1 for details of these diseases in 2015
*Data not reported to HSE area level when total number in Ireland <5 cases
#Hepatitis E became notifiable on the 15/12/2015.
^Since 17/03/2013, figures for *Chlamydia trachomatis*, noroviral infection, respiratory syncytial virus infection and rotavirus infection may refer to notifications from HSE E rather than events. Such notifications from HSE E may also refer to area of laboratory testing rather than patient's area of residence
‡*C. difficile* figures in the *C. difficile* chapter are presented by quarter rather than using the 2015 epidemiological calendar year as shown here
§Legionellosis figures include both Legionnaires' disease and Pontiac fever cases
||Streptococcus group B (*Streptococcus agalactiae*) infection (invasive) in infants <90 days old or stillborn infants

Table A1.4 Number of notifiable infectious diseases by age group (years), 2015

Infectious Disease	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65+	Unknown	Total
Bacillus cereus food-borne infection/intoxication	1	0	0	0	0	0	0	0	0	0	0	1
Bacterial meningitis (not otherwise specified)	17	3	0	1	0	2	2	3	1	3	0	32
Campylobacter infection	542	156	90	111	173	325	238	227	219	366	5	2452
Carbapenem-resistant Enterobacteriaceae infection (invasive)	0	0	0	0	0	0	0	1	1	6	0	8
Chickenpox - hospitalised cases	37	16	0	2	0	4	4	1	1	4	0	69
Chikungunya disease	0	0	0	0	0	0	0	1	0	0	0	1
Chlamydia trachomatis infection^	*	*	*	632	2726	2598	608	160	39	6	11	6797
Clostridium difficile infection†	37	15	15	23	30	82	96	106	210	1323	6	1943
Clostridium perfringens (type A) food-borne disease	0	0	0	0	0	0	0	0	0	1	0	1
Creutzfeldt Jakob disease	0	0	0	0	0	0	0	1	2	2	0	5
Cryptosporidiosis	215	103	38	19	18	31	7	3	3	2	0	439
Cytomegalovirus infection (congenital)	15	0	0	0	0	0	0	0	0	0	0	15
Dengue fever	0	0	0	0	1	3	2	2	0	0	0	8
Diphtheria	0	0	0	0	0	0	0	1	0	0	0	1
Giardiasis	25	12	7	4	6	36	20	12	7	16	0	145
Gonorrhoea	*	*	*	149	363	511	194	63	18	3	0	1302
Haemophilus influenzae disease (invasive)	20	2	0	1	3	4	2	2	0	18	0	52
Hepatitis A (acute)	4	6	4	2	6	5	5	2	0	2	0	36
Hepatitis B (acute and chronic)	4	1	1	6	49	231	144	66	25	22	0	549
Hepatitis C	1	0	0	2	30	200	221	125	65	31	0	675
Hepatitis E#	0	0	0	0	0	1	0	0	2	0	0	3
Herpes simplex (genital)	*	*	*	133	353	431	209	75	47	23	0	1274
Human immunodeficiency virus infection	*	*	*	6	33	207	153	63	17	5	0	485
Influenza	216	127	71	86	70	258	301	224	316	997	15	2681
Legionellosis‡	0	0	0	0	0	0	1	3	2	6	0	12
Leptospirosis	0	0	0	0	0	3	2	4	6	1	0	16
Listeriosis	3	0	0	0	0	1	4	1	1	9	0	19
Lyme disease	0	1	1	0	0	1	3	1	2	3	0	12
Lymphogranuloma venereum	*	*	*	0	1	12	3	3	1	0	0	20
Malaria	2	2	2	4	8	13	28	19	1	2	0	81
Measles	0	0	1	1	0	0	0	0	0	0	0	2
Meningococcal disease	28	8	4	14	2	1	7	1	3	7	0	75
Mumps	42	86	178	630	564	270	120	62	40	22	0	2014
Noroviral infection^	374	31	15	17	5	35	47	37	74	625	2	1262
Paratyphoid	0	0	0	0	1	0	0	0	0	0	0	1
Pertussis	65	8	10	6	5	6	7	8	1	1	0	117
Q fever	0	0	0	0	0	0	2	0	0	2	0	4
Respiratory syncytial virus infection^	1984	19	7	5	5	10	22	25	25	96	4	2202
Rotavirus infection^	3855	128	29	10	6	19	12	10	18	69	2	4158
Rubella	1	0	0	0	1	0	0	0	0	0	0	2
Salmonellosis	54	17	7	13	24	58	27	17	22	30	0	269
Shigellosis	10	5	1	1	7	25	16	15	7	2	1	90
Streptococcus group A infection (invasive)	15	8	2	2	8	8	14	7	9	34	0	107
Streptococcus group B infection (invasive)‖	69	0	0	0	0	0	0	0	0	0	0	69
Streptococcus pneumoniae infection (invasive)	43	15	4	2	3	21	38	34	82	307	0	549
Syphilis	*	*	*	0	50	184	110	70	22	2	0	438
Tetanus	0	0	0	0	0	0	1	0	0	0	0	1
Toxoplasmosis	1	0	1	1	1	9	8	1	2	2	0	26
Trichomoniasis	*	*	*	0	10	18	15	12	3	0	0	58
Tuberculosis	2	6	6	11	15	77	52	32	39	63	0	303
Typhoid	1	0	2	0	0	3	2	1	0	0	0	9
Verotoxigenic *Escherichia coli* infection	290	66	36	24	32	50	55	35	55	83	4	730
Viral encephalitis	4	1	0	1	2	7	3	7	7	15	0	47
Viral meningitis	139	8	8	14	14	39	21	7	6	4	1	261
Yersiniosis	2	3	1	0	0	2	0	1	1	3	0	13

Notes:
1. This table does not include details of diseases for which a zero number of cases were notified; see Table A1.1 for details of these diseases in 2015
*Data for the age groups 0-4 years, 5-9 years and 10-14 years are not presented here, but data for the age group 0-14 years are available in the STI annual slide-set at http://www.hpsc.ie
#Hepatitis E became notifiable on the 15/12/2015.
^Since 17/03/2013, figures for *Chlamydia trachomatis*, noroviral infection, respiratory syncytial virus infection and rotavirus infection may refer to notifications from HSE E rather than events. Such notifications from HSE E may also refer to area of laboratory testing rather than patient's area of residence
†*C. difficile* figures in the *C. difficile* chapter are presented by quarter rather than using the 2015 epidemiological calendar year as shown here
‡Legionellosis figures include both Legionnaires' disease and Pontiac fever cases
‖Streptococcus group B (*Streptococcus agalactiae*) infection (invasive) in infants <90 days old or stillborn infants

Table A1.5 Number of notifiable infectious diseases by gender, 2015

Infectious Disease	Male	Female	Unknown	Total
Bacillus cereus food-borne infection/intoxication	0	1	0	1
Bacterial meningitis (not otherwise specified)	18	14	0	32
Campylobacter infection	1303	1145	4	2452
Carbapenem-resistant Enterobacteriaceae infection (invasive)	5	3	0	8
Chickenpox - hospitalised cases	38	29	2	69
Chikungunya disease	0	1	0	1
Chlamydia trachomatis infection^	3214	3556	27	6797
Clostridium difficile infection†	743	1199	1	1943
Clostridium perfringens (type A) food-borne disease	0	1	0	1
Creutzfeldt Jakob disease	2	3	0	5
Cryptosporidiosis	233	205	1	439
Cytomegalovirus infection (congenital)	10	5	0	15
Dengue fever	2	6	0	8
Diphtheria	0	1	0	1
Giardiasis	87	58	0	145
Gonorrhoea	1081	220	1	1302
Haemophilus influenzae disease (invasive)	26	26	0	52
Hepatitis A (acute)	20	16	0	36
Hepatitis B (acute and chronic)	332	215	2	549
Hepatitis C	457	215	3	675
Hepatitis E#	1	2	0	3
Herpes simplex (genital)	341	927	6	1274
Human immunodeficiency virus infection	369	116	0	485
Influenza	1187	1485	9	2681
Legionellosis‡	6	6	0	12
Leptospirosis	12	4	0	16
Listeriosis	8	11	0	19
Lyme disease	6	6	0	12
Lymphogranuloma venereum	20	0	0	20
Malaria	56	25	0	81
Measles	2	0	0	2
Meningococcal disease	42	33	0	75
Mumps	1173	838	3	2014
Noroviral infection^	599	659	4	1262
Paratyphoid	1	0	0	1
Pertussis	50	67	0	117
Q fever	4	0	0	4
Respiratory syncytial virus infection^	1171	1029	2	2202
Rotavirus infection^	2192	1962	4	4158
Rubella	1	1	0	2
Salmonellosis	135	134	0	269
Shigellosis	61	29	0	90
Streptococcus group A infection (invasive)	60	47	0	107
Streptococcus group B infection (invasive)‖	37	25	7	69
Streptococcus pneumoniae infection (invasive)	265	284	0	549
Syphilis	412	26	0	438
Tetanus	1	0	0	1
Toxoplasmosis	11	15	0	26
Trichomoniasis	0	58	0	58
Tuberculosis	182	121	0	303
Typhoid	5	4	0	9
Verotoxigenic *Escherichia coli* infection	345	385	0	730
Viral encephalitis	21	25	1	47
Viral meningitis	139	117	5	261
Yersiniosis	10	3	0	13
Total	16496	15363	82	31941

Notes:
1. This table does not include details of diseases for which a zero number of cases were notified; see Table A1.1 for details of these diseases in 2015
#Hepatitis E became notifiable on the 15/12/2015.
^Since 17/03/2013, figures for *Chlamydia trachomatis*, noroviral infection, respiratory syncytial virus infection and rotavirus infection may refer to notifications from HSE E rather than events. Such notifications from HSE E may also refer to area of laboratory testing rather than patient's area of residence
†*C. difficile* figures in the *C. difficile* chapter are presented by quarter rather than using the 2015 epidemiological calendar year as shown here
‡Legionellosis figures include both Legionnaires' disease and Pontiac fever cases
‖Streptococcus group B (*Streptococcus agalactiae*) infection (invasive) in infants <90 days old or stillborn infants

Table A1.6 Number of notifiable infectious diseases by case classification, 2015

Infectious Disease	Confirmed	Probable	Possible	Total
Bacillus cereus food-borne infection or intoxication	1	0	0	1
Bacterial meningitis (not otherwise specified)	16	9	7	32
Campylobacter infection	2451	1	0	2452
Carbapenem-resistant Enterobacteriaceae infection (invasive)	8	0	0	8
Chickenpox - hospitalised cases	44	0	25	69
Chikungunya disease	0	1	0	1
Chlamydia trachomatis infection (genital)^	6797	0	0	6797
Clostridium difficile infection†	1943	0	0	1943
Clostridium perfringens (type A) food-borne disease	1	0	0	1
Creutzfeldt Jakob disease	5	0	0	5
Cryptosporidiosis	434	5	0	439
Cytomegalovirus infection (congenital)	15	0	0	15
Dengue fever	8	0	0	8
Diphtheria	1	0	0	1
Giardiasis	145	0	0	145
Gonorrhoea	1302	0	0	1302
Haemophilus influenzae disease (invasive)	51	0	1	52
Hepatitis A (acute)	35	1	0	36
Hepatitis B (acute and chronic)	549	0	0	549
Hepatitis C	675	0	0	675
Hepatitis E#	3	0	0	3
Herpes simplex (genital)	1251	23	0	1274
Human immunodeficiency virus infection	485	0	0	485
Influenza	2634	13	34	2681
Legionellosis‡	11	1	0	12
Leptospirosis	16	0	0	16
Listeriosis	19	0	0	19
Lyme disease	12	0	0	12
Lymphogranuloma venereum	20	0	0	20
Malaria	81	0	0	81
Measles	2	0	0	2
Meningococcal disease	66	0	9	75
Mumps	998	381	635	2014
Noroviral infection^	1262	0	0	1262
Paratyphoid	1	0	0	1
Pertussis	75	8	34	117
Q fever	4	0	0	4
Respiratory syncytial virus infection^	2202	0	0	2202
Rotavirus infection^	4132	26	0	4158
Rubella	0	0	2	2
Salmonellosis	269	0	0	269
Shigellosis	87	3	0	90
Streptococcus group A infection (invasive)	105	2	0	107
Streptococcus group B infection (invasive)‖	69	0	0	69
Streptococcus pneumoniae infection (invasive)	368	0	181	549
Syphilis	438	0	0	438
Tetanus	1	0	0	1
Toxoplasmosis	26	0	0	26
Trichomoniasis	58	0	0	58
Tuberculosis	200	56	47	303
Typhoid	9	0	0	9
Verotoxigenic *Escherichia coli* infection	600	126	4	730
Viral encephalitis	46	0	1	47
Viral meningitis	251	8	2	261
Yersiniosis	13	0	0	13
Total	30295	664	982	31941

Notes:
1. This table does not include details of diseases for which a zero number of cases were notified; see Table A1.1 for details of these diseases in 2015
2. The case definitions booklet, available at www.hpsc.ie has been updated since 2016; case classifications are assigned to notifications as per the Case Definitions for Notifiable Diseases during 2015
^Since 17/03/2013, figures for *Chlamydia trachomatis*, noroviral infection, respiratory syncytial virus infection and rotavirus infection may refer to notifications from HSE E rather than events. Such notifications from HSE E may also refer to area of laboratory testing rather than patient's area of residence
†*C. difficile* figures in the *C. difficile* chapter are presented by quarter rather than using the 2015 epidemiological calendar year as shown here
‡Legionellosis figures include both Legionnaires' disease and Pontiac fever cases
‖Streptococcus group B (*Streptococcus agalactiae*) infection (invasive) in infants <90 days old or stillborn infants

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Explanatory Notes

Notifiable Infectious Diseases

Computerised Infectious Disease Reporting (CIDR) system

For the majority of the notifiable infectious diseases (see Appendix 1), data were collated using the Computerised Infectious Disease Reporting (CIDR) system. During 2015, notification data were inputted directly by areas using the system. Enhanced surveillance was undertaken for certain diseases and these data are collated on CIDR. Outbreak data were also collated on CIDR using the same process outlined above. Weekly Reports on infectious disease notifications (including a separate report for *Clostridium difficile associated disease,* HIV & STIs) and outbreaks were produced by HPSC and published on the HPSC website, www.hpsc.ie. Throughout the year data were cleaned and validated on an ongoing basis and final data checks and cleaning were undertaken following year end by HPSC and the Departments of Public Health. Data analysis was performed using CIDR Business Objects Reporting and MS Excel. Figures for the relevant chapters within this report were extracted from CIDR between February and November 2016. These figures may differ from those previously published due to ongoing updating of data on CIDR.

HIV

HIV was made a notifiable disease in Ireland in September 2011. Since 1st January 2012, CIDR has been used to record notifications of HIV, thereby allowing the replacement of HIV case based reporting. Since 1st January 2012, AIDS diagnoses are only reported if they occur at the time of HIV diagnoses. In January 2015, there was a change to the surveillance case definition for HIV in HSE East (Dublin, Kildare and Wicklow). Previously, confirmatory testing by the National Virus Reference Laboratory (NVRL) was required on two separate samples prior to notification. From January 2015 onwards, confirmatory testing by NVRL on one sample was sufficient prior to notification. This change has resulted in increased notifications and more timely notifications.

Sexually Transmitted Infections (STIs)

Data on ano-genital warts (AG) and non-specific urethritis (NSU) are not collated using the CIDR system. Instead, clinicians notified their respective Departments of Public Health of cases of ano-genital warts and non-specific urethritis. Data for 2015 were collated and analysed by Departments of Public Health and aggregated data were reported quarterly to HPSC. National data were collated on an MS Access database, analysis preformed and reports produced by HPSC.

Data on all other STIs are collated using the CIDR system, including: chancroid, *Chlamydia trachomatis* infection, gonorrhoea, granuloma inguinale, herpes simplex (genital), lymphogranuloma venereum, syphilis and trichomoniasis.

Other Surveillance Systems

Influenza/Influenza-like illness Surveillance Systems

Since 2000, HPSC has worked in collaboration with the National Virus Reference Laboratory (NVRL), the Irish College of General Practitioners (ICGP) and the Departments of Public Health on the influenza sentinel surveillance project. Sixty-one general practices (located in all HSE-Areas and representing 5.8% of the population) were recruited to report electronically, on a weekly basis, the number of patients who consulted with influenza-like illness (ILI). ILI is defined using the Irish case definition for ILI which is sudden onset of symptoms AND at least one of the following four systemic symptoms: fever, malaise, headache, myalgia; AND at least one of the following three respiratory symptoms: cough, sore throat, shortness of breath. Sentinel GPs were requested to send a combined nasal and throat swab on one ILI patient per week to the NVRL. The NVRL also tested respiratory non-sentinel specimens, referred mainly from hospitals. Other surveillance systems set up to monitor influenza/ILI activity include a network of sentinel hospitals reporting admissions data. The Departments of Public Health also notified HPSC weekly of all cases of influenza (including hospitalisation status), all acute respiratory infection and influenza outbreaks and enhanced surveillance data on all hospitalised cases of confirmed influenza in 0-14 year olds. HPSC was notified of all registered deaths on a daily basis from the General Register Office.

Several surveillance projects that were initiated/augmented during the 2009 influenza pandemic were continued during subsequent influenza seasons:

- Surveillance of all calls to GP out-of-hours (OOHs) centres were monitored for self-reported influenza. These data were provided by HSE-NE.

- Intensive Care Society of Ireland (ICSI) and the Critical Care Programme (CCP) enhanced surveillance of all critical care patients with confirmed influenza in all critical care units.
- Enhanced surveillance of all confirmed influenza deaths.

Other routine surveillance include the monitoring of the uptake of the seasonal influenza vaccine among residents in long term care facilities (LTCFs) and that of the health care workers in both LTCFs and hospitals since the 2011/2012 season. Uptake levels by different categories of staff over time, along with other details are presented in the influenza chapter of this report.

At HPSC, data were collated from the various sources, analysed and routine reports were produced. Influenza surveillance reports were posted on the HPSC website www.hpsc.ie. Aggregated clinical and virological data and anonymised data on confirmed influenza cases admitted to hospital were reported weekly to the European Centre for Disease Prevention and Control (ECDC).

Immunisation Uptake

- **Immunisation uptake among children at 12 and 24 months of age**

Each HSE Area maintains a childhood immunisation database. In 2015, HSE Areas provided HPSC with immunisation uptake data for their area and for each of the Local Health Offices in their area on a quarterly basis. National data were collated and analysed at HPSC using a MS Excel database. Quarterly reports were produced and are available on the HPSC website. For further details on methods used, please see the immunisation uptake chapter within this report.

- **HPV, MenC booster and Tdap vaccine uptake 2014/2015**

HPV, MenC booster and Tdap vaccinations provided through the schools immunisation programme are collated on the national School Immunisation System (SIS). Uptake of these vaccines, provided through the school immunisation programme in the academic year 2014/2015 and recorded on the database, are reported in the chapter within this report. Further details are provided within the chapter.

- **DTaP/IPV and MMR vaccine uptake 2014/2015**

Since the 2011/2012 academic year, the uptake of the DTaP/IPV and MMR vaccines in 4-5 year old schoolchildren (at Junior Infant level) has been monitored across all Local Health Offices (LHOs) each year. Each LHO provides details of the cohort size and the number of vaccinated children and the returns collated to calculate uptake levels which are also presented in maps in the 'DTaP/IPV and MMR vaccine uptake 2014/2015' chapter.

European Antimicrobial Resistance Surveillance Network (EARS-Net)

Data were collected by participating EARS-Net (formerly the European Antimicrobial Resistance Surveillance System, EARSS) laboratories in 2015 on the first invasive isolate per patient per quarter on *Staphylococcus aureus, Enterococcus faecium* and *Enterococcus faecalis* from blood only and on *Streptococcus pneumoniae*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa and Acinetobacter* spp. from blood and/or cerebrospinal fluid (CSF). Data were reported quarterly to HPSC, via WHONET software, and collated in an MS Access database. Quarterly and annual reports were produced.

Antimicrobial consumption

Community (outpatient) consumption data were obtained from IMS Health and represent wholesaler to retail pharmacy sales figures for Ireland. Hospital (inpatient) consumption data were obtained directly from clinical pharmacies and validated with the support of the Irish Antimicrobial Pharmacists Association. Quarterly and annual consumption trends by named public acute hospitals are published on the HPSC website. All data were interpreted using the WHO Anatomical Therapeutic Chemicals index (www.whocc.no/atcddd/) in line with European Surveillance of Antimicrobial Consumption (ESAC-Net) methodology, which is now managed by the ECDC. See relevant section for notes on the denominator data.

Healthcare associated infections

- ***Clostridium difficile:*** Data on *C. difficile* enhanced surveillance were collected by participating hospitals, reported quarterly to HPSC and stored in an MS Access database. Quarterly and annual reports were produced.
- Data were also collected on the total volume of alcohol-based hand rub used per hospital per year/quarter, excluding that used for pre-operative surgical "scrub". See relevant section for notes on the denominator data. The rate of usage per hospital was calculated as the total volume of hand rub consumed (in litres) per 1000 bed days used, and quarterly and annual reports were produced for publication on the HPSC website.

Denominator Data

To calculate disease incidence rates, Census of Population data were used as the denominator (available from the Central Statistics Office, http://www.cso.ie). Population figures were applied as follows:

- Census 2011 for analysis of 2009-2015 data
- Census 2006 for analysis of 2004-2008 data
- Census 2002 for 2000-2003 data
- Census 1996 for 1999 data

Monthly population changes were estimated between 1993 and 2014 using a curve interpolation method for the calculation of outpatient antibiotic consumption rate.

Bed-days used and other activity data for public acute hospitals were provided by the Performance Monitoring Unit of the HSE and used to calculate rates of MRSA, hospital antibiotic consumption and rates used in other hospital-based surveillance systems. Similar activity data were obtained directly from private acute hospitals.

HSE Areas

Although organisational changes have taken place in the Health Services, the term HSE Areas are used in this report when analysing and presenting data by geographical area (equating to the eight former health board regions/areas). This is because operationally the surveillance, prevention and control of infectious diseases are still managed by eight Departments of Public Health, one in each HSE Area.

Regional Directors of Operations (RDO's)

The range of health and personal social services provided by the HSE and its funded agencies were managed within four regions known as RDOs. Details of the four RDOs and their relationship with the eight HSE areas are shown below.

1. Dublin Mid Leinster (HSE-Midland plus CCA1-5 and CCA9-10 of HSE-East)
2. Dublin North East (HSE-North East plus CCA6-8 of HSE-East)
3. South (HSE-South and HSE-South East)
4. West (HSE-Midwest, HSE-North West and HSE-West)

Community Healthcare Organisations

Community Healthcare Services are the broad range of services that are provided outside of the acute hospital system and includes Primary Care, Social Care, Mental Health and Health & Wellbeing Services. These services are delivered through the HSE and its funded agencies to people in local communities, as close as possible to people's homes. The document Community Healthcare Organisations – Report and Recommendations of the Integrated Service Area Review Group, published in October 2014, sets out how health services, outside of acute hospitals, will be organised and managed. This document is available at http://www.hse.ie/eng/services/publications/corporate/CHOReport.html

Glossary of Terms

AHR	Alcohol hand rubs
CDI	*Clostridium difficile* infection
CIDR	Computerised Infectious Disease Reporting
CIR	Crude incidence rate
DoH	Department of Health
EARS-Net	European Antimicrobial Resistance Surveillance Network
ECDC	European Centre for Disease Prevention and Control
EISN	European Influenza Surveillance Network
ICGP	Irish College of General Practitioners
ILI	Influenza-like illness
IMMRL	Irish Meningococcal and Meningitis Reference Laboratory
IPD	Invasive pneumococcal disease
HCAI	Healthcare associated infections
HCWs	Healthcare Workers
HPSC	Health Protection Surveillance Centre
HSE	Health Services Executive
HSE E	HSE Eastern Region
HSE M	HSE Midland Area
HSE MW	HSE Mid-Western Area
HSE NE	HSE North Eastern Area
HSE NW	HSE North Western Area
HSE SE	HSE South Eastern Area
HSE S	HSE Southern Area
HSE W	HSE Western Area
LTCFs	Long term care facilities
MRSA	Meticillin Resistance *Staphylococcus aureus*
MSM	Men who have sex with men
NSSLRL	National *Salmonella*, *Shigella* and *Listeria* Reference Laboratory
NIO	National Immunisation Office
NVRL	National Virus Reference Laboratory
PWID	People who inject drugs
SIS	School Immunisation System
STIs	Sexually Transmitted Infections
TB	Tuberculosis
WHO	World Health Organization

hpsc

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